QUANTITATIVE HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

FORMER SALMONIER CORRECTIONAL FACILITY SALMONIER, NEWFOUNDLAND AND LABRADOR

Prepared by:
Conestoga-Rovers & Associates

1118 Topsail Road
P.O. Box 8353, Station A
St. John's, Newfoundland
Canada A1B 3N7

Office: (709) 364-5353
Fax: (709) 364-5368

web: http:\\www.CRAworld.com

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EXECUTIVE SUMMARY

Conestoga-Rovers & Associates (CRA) was retained by Government of Newfoundland and Labrador Department of Environment and Conservation (DOEC) to conduct a Quantitative Human Health and Ecological Risk Assessment (HHERA) for the Former Salmonier Correctional Facility (SCF) in Salmonier, Newfoundland and Labrador (Figure 1). The former SCF property is approximately 902 hectares in size with approximately 53 hectares of the property previously used for operation of the former SCF (Figure 2). The remainder of the property is undeveloped land containing a mixture of mature boreal forest, water bodies, and bog/fen wetlands. The entire 902 hectare facility is currently vacant and will be referred to as the "Site" throughout this report. The intended future land use of the Site is redevelopment for cottage lots (approximately 200 cottage lots on Site and 140 lots adjacent to the Site; Figure 3).

Previous environmental site assessments (ESAs) were completed at the Site between 2004 and 2009 by MGI Limited (now Conestoga-Rovers & Associates) and SNC-Lavalin Inc. (SNC). Results of the previous investigations identified hydrocarbon impacted soils exceeding applicable Atlantic PIRI Tier I Risk Based Screening Levels (RBSLs). Detectable concentrations of pesticides/herbicides were also identified in on-Site soil and in sediments of three on-Site ponds (Oxley's Pond, Pond J and Pond K). Pesticides and herbicides were not detected in Site groundwater or surface water. Based on the previous ESA findings, SNC completed a Problem Formulation Sampling and Analysis Plan (PSAP) for pesticides in 2010. The purpose of the PSAP was to identify chemicals of potential concern (COPC), receptors of concern, and exposure pathways in the proposed redevelopment areas of the Site for ecological and human health evaluation. The PSAP focused on potential environmental impacts associated with former use of pesticides/herbicides in agricultural areas of the SCF. Since they are located outside the areas proposed for redevelopment, the PSAP did not evaluate or discuss petroleum hydrocarbons (PHCs) in soil or groundwater that were previously identified to exceed applicable guidelines in the former SCF infrastructure area, or potential metal COPCs in soil which may be present in previous infrastructure areas, due to historical use of lead based paint on former buildings.

As part of the HHERA evaluation, a supplemental field work program was completed between November 2010 and December 2010. The supplemental data collection program was prescribed in the PSAP and was intended to compliment the historical datasets as well as to obtain data necessary to determine if potential chemical impacts in soil at the Site, as well as sediment of the selected on-Site ponds, pose a risk to human health or ecological receptors. The supplemental HHERA field program therefore included collection of additional pesticide/herbicide information on sediment and fish

tissue from selected on-Site ponds, as well as evaluation of habitat in selected areas of the Site. The 2010 supplemental sampling program was focused on the potential presence of pesticides and herbicides in environmental media from the past usage of these chemicals at the Site.

The supplemental work program included the collection of sediment samples from three previously selected ponds (Oxley's Pond, Pond J and Pond K) as well as an on-Site reference pond. A total of 39 fish tissue samples were also collected from the four ponds. Fish samples were analyzed for selected pesticides and lipids. Sediment samples were analyzed for selected pesticides, organic carbon and/or grain size. Toxicological tests were completed on sediment samples collected from each of the four ponds (sediment benthos survival and growth testing and juvenile fathead minnow survival testing). Benthic density and diversity analyses were also conducted on the sediment samples collected from the four selected ponds.

The results of the 2010 sampling program, together with historical Site data, were used to complete a quantitative HHERA for the proposed Site redevelopment as cottage properties. Although the PSAP and subsequently the HHERA sampling plan focused on pesticides/herbicides as the primary COPC, the HHERA evaluation included historical data for other COPCs, such as petroleum hydrocarbons, at the screening stage.

The Site consists of numerous water bodies, wetlands, fields and forested areas that currently provide habitat and support a diversity of terrestrial, aquatic and semi-aquatic plant and animal species. The Ecological Risk Assessment (ERA) component of the project was therefore completed to determine if chemical constituents detected in soil, sediment or fish tissue at the Site (i.e., pesticides) pose a potential risk to terrestrial ecological receptors inhabiting the Site or aquatic ecological receptors of the on-Site ponds.

Ecological Risk Assessment (ERA):

Results of the preliminary quantitative ERA determined concentrations of chemical constituents detected in soil and sediment do not present an unacceptable risk to terrestrial, aquatic, or semi-aquatic receptors in the area. The sediment triad evaluation was completed as part of the ERA to evaluate potential risk to sediment invertebrates; the triad considered evidence from chemical concentrations, sediment bioassays, and field surveys of sediment macroinvertebrates. Physio-chemical analysis of the detectable pesticide concentrations in on-Site sediment determined the sediment would not likely be toxic to aquatic life. Consistent with this line of evidence, sediment bioassays with fish and midge larvae showed that pond sediments were not generally

toxic to either species. Again, consistent with these lines of evidence, the diversity of benthic macroinvertebrate communities in two of the three selected on-Site ponds is similar to the reference pond. The quantity and diversity of macroinvertebrates in the sediment samples collected from Oxley's Pond were, however, significantly reduced compared to other ponds. The reason for the reduced benthic diversity is not known but may be related to rocky substrate observed in this pond. Sediment toxicity testing and concentrations of pesticides in sediments both indicated that Oxley's Pond sediments are not toxic to benthic organisms.

Because many of the pesticides bioaccumulate readily in food chains, the ERA also considered potential risks to a variety of terrestrial and semi-aquatic vertebrates native to the Site. Pesticide exposures to these vertebrate receptors were estimated using simple food chain models and compared to toxicological reference values. These analyses demonstrated that current concentrations of pesticides in the sediments and soils do not pose unacceptable risk to vertebrate herbivores, omnivores, and predators feeding in the Site's terrestrial and aquatic habitats.

Based on the data available, residual pesticide concentrations in soil, sediment and fish tissue do not pose an unacceptable risk to ecological receptors present at the Site or that use the Site as a source of food and further evaluation of risk is not required.

Human Health Risk Assessment (HHRA):

The HHRA was conducted for the Site in general accordance with Health Canada's (HC) guidance documents for Federal Contaminated Site Risk Assessment in Canada, including, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), Draft Version 2.0 (HC, 2009a), Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, Draft Version 2.0 (HC, 2009b) and Part V: Guidance on Complex Human Health Detailed Quantitative Risk Assessment for Chemicals (DQRAchem), Draft Version 1.0 (HC, 2009c) all by the Contaminated Sites Division (CSD), Safe Environments Program, Health Canada, Ottawa.

Based on the human-health based screening process, the COPCs identified for further assessment included benzene, ethylbenzene, toluene, and TPH (fuel oil source), and dieldrin in soil and 2,4'-DDE, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-chlordane, dieldrin, endrin, hexachlorobenzene, methoxychlor, mirex, and trans-nonachlor in fish tissue.

The petroleum hydrocarbon (benzene, ethylbenzene, toluene, and TPH (fuel oil source)) COPCs in soil were further screened using the Atlantic RBCA Tier II pathway specific

guidelines, which indicated that petroleum hydrocarbon impacts on-Site would only be of concern if there were buildings or potable wells located in the area of the soil exceedances. It is noted that the elevated petroleum hydrocarbons in soil are present within the area formerly developed with SCF infrastructure, which is currently vacant and is not currently intended to be developed for cottage use. In addition to petroleum hydrocarbon COPC, metals COPCs may be also present in soil in this area, due to the possible past use of lead based paint on the former SCF buildings. The former SCF infrastructure area is indicated on Figures 11a and 11b. If future residential development plans are slated for this area, additional assessment would be required to further assess the potential risk to human resident receptors from petroleum hydrocarbon and potential metals impacts.

The remaining COPCs listed above, which are limited to pesticides in soil and fish, were evaluated quantitatively using the Health Canada PQRA/DQRA process. There were no human–health based COPCs identified through the screening process for groundwater, surface water, or sediment, and therefore impacts in these media are not considered a concern to human health at the Site.

For soil, the exposure pathways evaluated in the HHRA include incidental ingestion, dermal contact, and inhalation of vapours and soil particulates for future residents, recreational users and construction/utility workers. The resident was also evaluated for potential exposure to COPCs in soil through inhalation of indoor air, exposure to COPCs in potential on-site garden produce (based on uptake of COPCs in soil) and exposure to COPCs in fish tissue through ingestion.

Under the proposed future conditions, the target non-carcinogenic hazard quotient of 0.2 was exceeded for exposure of the resident to dieldrin in garden produce grown in site soil, based on the maximum soil concentration. There were no unacceptable non-carcinogenic hazards or cancer risks identified for the resident through other applicable exposure pathways including direct exposure to soil (ingestion, dermal contact and inhalation), indoor air inhalation and fish ingestion.

Under the proposed future conditions, there were no unacceptable non-carcinogenic hazards or cancer risks identified for the recreational user or construction worker.

A Site Specific Target Levels (SSTL) was developed for dieldrin in soil for the resident, based on ingestion of vegetation grown in site soil, as indicated below.

DIELDRIN IN SOIL SSTL – INGESTION OF GARDEN VEGETATION GROWN IN SITE SOIL (mg/kg)

COPC	*Site-Specific Target Level (mg/kg)*	*Maximum Detected Soil Concentration (mg/kg)*	*Number of Samples >SSTL (%)*
Dieldrin	**0.98**	**4.5**	**5 (6.25 %)**

The soil SSTL developed for the protection of residents from exposure to dieldrin from ingestion of garden produce grown in Site soil was exceeded at five locations (SS1, SS2, SS4, SS5 and TP-10), which are located within the "Area Requiring Additional Development", as outlined in Figures 11a and 11b. Since this area is not intended for redevelopment, there would be no garden produce grown in this area and therefore no ingestion of garden produce from this area would be possible unless the area were developed in the future.

A Site Specific Target Level (SSTL) was also developed for dieldrin in soil for the resident, based on direct exposure to soil (ingestion, dermal contact and inhalation), as indicated below.

DIELDRIN IN SOIL SSTL - DIRECT EXPOSURE TO SOIL (mg/kg)

COPC	*Site-Specific Target Level (mg/kg)*	*Maximum Detected Soil Concentration (mg/kg)*	*Number of Samples >SSTL (%)*
Dieldrin	**4.8**	**4.5**	**0 (0 %)**

Based on the results of the HHRA, residual dieldrin concentrations in soil, sediment, fish, groundwater and surface water do not pose unacceptable risks or hazards to potential human receptors of the proposed cottage development, conditional on the area outlined in Figures 11a and 11b remaining undeveloped.

Additional analyses and risk assessment would be required prior to proceeding with residential development within the "Area Requiring Additional Assessment", as defined in Figures 11a and 11b. The recommended "Area Requiring Additional Assessment" illustrated in these figures has been expanded beyond the area of former SCF infrastructure, as discussed below.

The soil SSTL developed for the protection of residents from exposure to dieldrin from ingestion of garden produce grown in Site soil was exceeded at five locations (SS1, SS2,

SS4, SS5 and TP-10), which are generally located within former SCF infrastructure area. The previously identified petroleum hydrocarbon and potential metals impacts in soil requiring further assessment are also located within this area. However, sample SS5 is located southeast of the former SCF infrastructure area. It was therefore recommended that the area surrounding sample SS5 (proposed Lots 129 to 132) be included in the area not intended for residential cottage development unless remediation or further soil and/or vegetation sampling, analyses and risk assessment is completed in this area. This additional area has been included in the "Area Requiring Additional Assessment" illustrated on Figures 11a and 11b.

It is also noted that delineation of dieldrin in soil has not been achieved to generic guidelines or garden produce ingestion-based SSTLs north of soil samples SS2 and TP-10. Therefore, it has been recommended that additional soil and/or vegetation sampling be completed north of these sample locations prior to developing proposed lots 116 to 120. The area including these lots was also added to the "Area Requiring Additional Assessment" illustrated on Figures 11a and 11b.

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LIST OF ACRONYMS

ALS	ALS Laboratories
Aquatox	Aquatox Testing and Consulting Inc.
ATSDR	Agency for Toxic Substances and Disease Registry
ACCDC	Atlantic Canada Conservation Data Centre
BCs	Benchmark concentrations
BCOCs	Bioaccumulative Chemical Constituents
BCF	Bioconcentration Factor
BTEX	Benzene, Toluene, Ethyl benzene and Xylenes
bw	Body Weight
CCME	Canadian Council of Ministers of the Environment
COC	Contaminants of Concern
COPC	Constituents of Potential Concern
COPEC	Compounds of Potential Ecological Concern
COSEWIC	Committee of the Status of Endangered Wildlife in Canada
CoSQB	Co-occurrence Sediment Quality Benchmarks
CRA	Conestoga-Rovers & Associates
CSD	Contaminated Sites Division
CSM	Conceptual Site Model
Currie	R.A. Currie Biological Consulting Inc.
DFO	Department of Fisheries and Oceans Canada
DI	Shannon-Weaver Diversity Index
DOEC	Government of Newfoundland and Labrador Department of Environment and Conservation
EEC	Estimated Exposure Concentration
EqP	Equilibrium Partitioning Approach
ERA	Ecological Risk Assessment
ESA	Environmental Site Assessment
ESV	Ecological Screening Value
FCV	Final Chronic Value
FID	Flame Ionization Detector
FOC	Fraction of Organic Carbon
FOD	Frequency of Detection
HC	Health Canada
HHERA	Human Health and Ecological Risk Assessment
HHRA	Human Heath Risk Assessment
HQ	Hazard Quotient
ICP	Inductively Coupled Plasma
ISQG	Interim Sediment Quality Guidelines

LIST OF ACRONYMS

Koc	Partition Coefficient
Kow	Octanol-Water Coefficient
km	Kilometre
LC50	Acutely Lethal Concentration
LOAEL	Lowest Adverse Effects Level
LNAPL	Light Non-Aqueous Phase Liquid
masl	metres above sea level
MELPBC	Ministry or Environment, Lands and Parks, Province of British Columbia
MGI	MGI Limited
N	Number of Individuals or samples
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
NT	Total Number of Organisms
OC	Organochlorine
ODS	Ozone Depleting Substance
PEL	Probable Effects Level
PIRI	Partners in RBCA Implementation
ppb	Parts per Billion
PSAP	Problem Formulation Sampling and Analysis Plan
PQRA	Preliminary Quantitative Risk Assessment
PW	Pore Water
QA/QC	Quality Assurance/Quality Control
RAP	Remedial Action Plan
RBCA	Risk-Based Corrective Action
RFP	Request for Proposal
RBSLs	Risk Based Screening Levels
RDL	Reportable Detection Limit
RMP	Risk Management Plan
RPD	Relative Percent Difference
SAR	Species at Risk
SARA	Species at Risk Act
SCF	Salmonier Correctional Facility
SNC	SNC Lavalin
SQ	Screening Quotient
SQG	Soil Quality Guidelines
SSTLs	Site Specific Target Levels
TAB	Technical Assistance Bulletin
TCEQ	Texas Commission on Environmental Quality

LIST OF ACRONYMS

TEL	Threshold Effects Level
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbon
TRV	Toxicological Reference Values
UCL	Upper Confidence Level
UF	Uptake Factor
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VECs	Valued Ecosystem Components
%	Percent

1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) was retained by Government of Newfoundland and Labrador Department of Environment and Conservation (DOEC) to conduct a Quantitative Human Health and Ecological Risk Assessment (HHERA) for the Former Salmonier Correctional Facility (SCF) in Salmonier, Newfoundland and Labrador (Figure 1). The former SCF property is approximately 902 hectares in size with approximately 53 hectares of the property previously used for operation of the former SCF (Figure 2). Approximately 8 hectares were historically used for infrastructure and 45 hectares formerly used for farmland and agriculture. The remainder of the property is undeveloped land containing a mixture of mature boreal forest, water bodies, and bog/fen wetlands. The entire 902 hectare facility will be referred to as the "Site" throughout this report. The Site location and the property boundary outlines are shown on Figures 1 and 2, respectively.

Historical development and operations at the Site, in particular the 45 hectare agricultural land area, resulted in pesticide and herbicide application with at least one field reportedly over-treated with aldrin. The intended future land use of the Site is redevelopment for cottage lots (approximately 200 cottage lots) as part of a larger redevelopment plan referred to as the Salmonier Cottage Initiative (DOEC, 2008). A proposed redevelopment plan showing the intended lot locations within the Site boundaries and adjacent to the Site is presented as Figure 3. As such, the DOEC has completed several phased environmental site assessments (ESAs) as well as a Human Health and Ecological Risk Assessment Problem Formulation and Sampling Analysis Plan (PSAP). The results of these environmental investigations have indicated elevated concentrations of dieldrin within Site soils as well as detectable concentrations of pesticides and herbicides in sediment of several on-Site ponds. Therefore, further investigative activities and a quantitative risk assessment were recommended in the PSAP prepared by SNC-Lavalin Inc. (SNC).

The purpose of the HHERA field program was to collect additional information on sediment and fish tissue from selected on-Site ponds as well as evaluate habitat in selected areas of the Site. The information collected is intended to supplement data collected from the Site during previous assessment programs and to provide the data necessary for completion of a quantitative human health risk assessment (HHRA) and ecological risk assessment (ERA).

This report provides an overview of the previous environmental programs completed at the Site, presents the analytical data collected during the supplemental sampling program completed in 2010, and the results of the HHERA evaluation.

1.1 SITE DESCRIPTION

The former SCF is located approximately 50 km west of St. John's NL on the Salmonier Line (Route 90), approximately 10 km from the intersection of the Salmonier Line and Trans Canada Highway. The Site is approximately 902 hectares in size with the majority of the Site being undeveloped land containing a mixture of mature boreal forest, water bodies, and bog/fen wetlands. Water bodies including Oxley's Pond and Little Gull Pond comprise approximately 30 percent (%) of the total undeveloped property.

As previously described, approximately 53 hectares of Site were previously used for operation of the former SCF. Approximately 8 hectares were historically used for infrastructure and 45 hectares formerly used for farmland and agriculture. The former SCF operated at this location from approximately 1941 to 2004 with the developed portion of the Site containing 24 buildings, various fields and cleared areas, two sanitary landfills and a metals dump. All buildings and infrastructure were removed from the Site in 2007 and the three landfills were reportedly decommissioned in 2007. There is an existing road network within the Site that was previously used for accessing the SCF and agricultural fields. Site Plans showing the former developed areas of the Site and former building locations are included as Figures 4A to 4D. Photographs of the Site collected during the 2010 assessment program are included in Appendix A.

The Site is surrounded by a cottage area to the north and west commonly referred to as Deer Park and by undeveloped vegetated land. Camp and residential lots are also located to the east of the Site, along Salmonier Line. The Salmonier Nature Park is located to the east of the Site and east of the Salmonier Line. This park is a centre for environmental education, wildlife rehabilitation, research and environmental monitoring. Further east and south of the Salmonier Nature Park is the Avalon Wilderness Reserve. This is a 1,070 square kilometre (km^2) wilderness area with a landscape of barrens, ponds, rivers, bogs, small forests, and thickets. This reserve protects the Avalon woodland caribou herd, the most southerly caribou herd in Canada. The reserve also contains prime habitat for waterfowl, moose, willow ptarmigan (known locally as "partridge") as well as other flora and fauna.

1.2 PREVIOUS STUDIES

Previous environmental site assessments (ESAs) were completed at the Site between 2004 and 2010 by MGI Limited (MGI; now Conestoga-Rovers & Associates) and SNC. The environmental programs previously completed and the reports reviewed in preparation of this report include:

- Phase I Environmental Site Assessment, Undeveloped Portion of the Site, MGI Limited, 2004 (MGI was acquired by CRA in 2005)
- Phase I/II Environmental Site Assessment – Developed Portion of the Site, MGI Limited, 2004 (MGI was acquired by CRA in 2005)
- Supplemental Phase II Environmental Site Assessment – SNC-Lavalin Inc., 2009
- Human Health and Ecological Risk Assessment Problem Formulation and Sampling Analysis Plan (PSAP) – SNC-Lavalin Inc., 2010

Soil, groundwater, surface water and sediment samples were collected as part of the previous ESAs programs completed at Site and the data is included in Appendix B. The historical sampling locations are also shown on Figures 5 to 7. A summary of the previous assessment findings is presented below.

Phase I ESA – Undeveloped Portion of the Site, MGI 2004

The Phase I ESA was completed on the undeveloped portion of land contained within the SCF property boundary. Based on the Site visits, historical information review and aerial photograph review, it was concluded that environmental concerns were not associated with the undeveloped portion of the SCF.

Phase I/II ESA – Developed Portion of the Site - MGI 2004

The Phase I/II ESA was completed on developed portion of land contained within the SCF property boundary. The developed portion of the Site contains 24 buildings and various cleared areas that were used for agricultural purposes. The Phase I ESA identified potential concerns associated with current and historical Site activities including the presence of three landfill sites (a wet dump, a dry dump and a third disposal area), the storage of various pesticides and herbicides in on-Site buildings, the historical usage of pesticides/herbicides on cleared areas and the storage and handling of fuel and waste oil at the Site. The Phase I ESA also identified the potential presence of hazardous building materials such as asbestos-containing material, ozone depleting substances (ODS), lead and mercury based paint and mould growth.

Based on the results of the Phase I ESA program, the Phase II ESA included the excavation of nine test pits in the vicinity of potential hydrocarbon sources, the collection of six soil samples and one surface water sample for analysis of pesticide and herbicide concentrations, the collection of two paint samples and one mould sample (Figures 4B to 4D). In addition, the USTs adjacent to the inmate's dormitory and warden's residence were removed during the Phase II ESA work and five soil samples were collected from each underground storage tank (UST) excavation (Figure 4C). A test pit was also excavated downgradient from each UST excavation.

The Phase II ESA identified petroleum hydrocarbon (PHC) impacted soils exceeding applicable Atlantic PIRI Tier I Risk Based Screening Levels (RBSLs) in excavations of the former USTs adjacent to the former Inmates Dormitory and Wardens Residence (Figure 4C). Potential contaminant impacts to groundwater were not evaluated during the Phase I/II ESA program. The Phase I/II report recommended completing an environmental risk assessment and developing a remedial action plan for petroleum hydrocarbons in the soil exceeding the Tier I RBSLs.

Detectable concentrations of dieldrin were also identified in all six of the soil samples collected. The Phase II ESA therefore recommended that further sampling should be conducted throughout the property to determine the extent of dieldrin impacted soil. Sampling of sediment in the on-Site ponds adjacent to the agricultural areas was also recommended to determine if dieldrin impacted sediments are present. In the interim, planting of root crops on the subject property was not recommended.

Additional recommendations made in the Phase II ESA based on the results obtained included:

- Remediation of the three landfill sites on the subject property (a wet dump, a dry dump and a third disposal area);
- Pesticides and herbicides stored in the emergency generator shed should be removed and disposed of by a licensed hazardous waste removal contractor;
- Potential PCB-containing light ballasts should be handled and disposed of according to standard practice and/or applicable regulations;
- An asbestos management plan should be adopted to maintain all remaining asbestos building material in good condition or removed by a licensed asbestos abatement contactor;
- Handling or disposal of ODS materials should be completed according to standard practice and/or applicable regulations; and,
- Mould growth was identified within the hennery and the mould should be removed using standard cleaning procedures.

Supplemental Phase II ESA –SNC 2009

Based on the findings of the MGI Phase II ESA, a Supplemental Phase II ESA was conducted to confirm the presence or absence of pesticide/herbicides in specific areas of concern. The Supplemental Phase II ESA involved the excavation of 20 test pits and drilling of 14 boreholes completed as monitor wells. A total of 25 sediment and 27 surface water samples were collected from the on-Site ponds, 59 soil samples were

collected from previously developed areas, and 15 groundwater samples were collected from the newly constructed monitor wells. Petroleum hydrocarbon evaluation in soil or groundwater was not included in the Supplemental Phase II ESA. Similarly, possible metal concentrations in soil from potential past use of lead and mercury containing paint was not evaluated as part of this investigation. The Phase II ESA indicated that the three on-Site landfills were decommissioned in 2007 but specific information on the location or decommissioning plan of the landfills was not provided.

The results of the Supplemental Phase II ESA along with the previous Phase II ESA identified elevated concentrations of dieldrin within Site soils. Sediment samples collected from Pond K contained α-chlordane, γ-chlordane, 4,4'-DDE, and heptachlor epoxide concentrations exceeding the CCME's, *Canadian Sediment Quality Guidelines for the Protection of Aquatic Life*, updated 2002. In addition, concentrations of aldrin, dichlofluanid, heptachlor, hexachlorobenzene, pentachloronitrobenzene, and propazine were detected in Oxley's Pond sediments, and dichlofluanid, profenophos, and propazine were detected within Pond J sediments. Pesticides and herbicides were not detected in Site groundwater or surface water.

Based on the findings, the supplemental ESA report recommended that the dieldrin impacts in soil should be addressed prior to allowing the subject property to be developed for future use including the recommendation to implement a PSAP. It was also recommended that additional sediment samples be collected to delineate a-chlordane, g-chlordane, 4,4'DDE and heptachlor epoxide contamination in sediment as part of the PSAP.

HHERA Problem Formulation and Sampling Analysis Plan

The purpose of the problem formulation was to identify chemicals of potential concern (COPC), receptors of concern, and exposure pathways at the Site for ecological and human receptors for the proposed future use as a residential cottage development. The PSAP focused on pesticides from agricultural operations at the former correctional facility. Since the proposed cottage development is proposed to occur in former agricultural areas, and the former area of SCF infrastructure is not planned for development, the PSAP did not address petroleum hydrocarbons in soil or groundwater that were previously identified to exceed applicable guidelines in the previous infrastructure areas, or potential metal COPCs in soil which may be present in previous infrastructure areas, due to historical use of lead based paint on former buildings. If future development, in this former SCF infrastructure area, is planned, additional assessment will be required to evaluate the PHC and metal COPCs potentially present in this area.

COPC for ecological receptors at the Site include dieldrin in soil and chlordane, DDE, dichlofluanid, heptachlor epoxide, pentachloronitrobenzene, profenophos, and propazine in sediment. Ecological receptors of concern include all plant, invertebrate, bird, mammal and amphibian species that have the potential to spend significant amounts of time feeding or breeding at the Site. The human health problem formulation identified dieldrin in soil and chlordane, DDE, dichlofluanid, heptachlor, heptachor epoxide, hexachlorobenzene, pentachloronitrobenzene, profenophos, and propazine in sediment as COPCs. People likely to be present at the Site under a future cottage land use include cottage residents of all ages and people using the Site for recreation.

The previous investigations conducted at the Site do not provide conclusive evidence that pesticide concentrations pose a risk to human and/or ecological health. Therefore, the PSAP recommended further investigative activities and a quantitative risk assessment be completed. Additional information identified in the PSAP that would be required to conduct a human health and ecological risk assessment included the following:

- Collection of fish fillets and whole fish from Oxley's Pond, Pond K, Pond J and a reference pond for the analysis of pesticides and lipids. Target fish species for sampling and analysis would be mature, consumable-sized trout;
- Confirmation of the aquatic and terrestrial habitat in the vicinity of the COPC detections in soil and sediment; and,
- Collection of surficial sediment (0 to 5 cm) for laboratory toxicity bioassays for aquatic invertebrates and fish fry as well as analysis of pesticides and organic carbon.

1.3 PROJECT OBJECTIVES

The main objective of this project was to complete supplemental environmental testing and obtain Site-specific information necessary for the completion of a HHERA for the evaluation of pesticide impacts in areas of the Site proposed for residential cottage development. The request for proposal (RFP) dated June 2010 identified the following tasks, at a minimum, that are required to achieve the objectives indicated above:

- Collection and analysis of fish tissue for pesticide and lipid content from Oxley's Pond, Pond K, Pond J, and a reference pond;

- Collection and analysis of surficial sediment samples for toxicity bioassays for aquatic invertebrates and fish fry as well as analysis of pesticides and organic carbon content;
- Completion of an aquatic and terrestrial habitat analysis in the vicinity of the soil and sediment COPC detections;
- Completion of a detailed HHERA for the Site based on the findings of the PSAP and additional investigations completed at the Site; and,
- Development of recommendations for additional work (if required) with schedules and cost estimates.

The HHERA work program therefore included the following tasks:

Task 1 – Background Review: Review available information for the area to determine applicable benchmarks (acts and regulations) used for screening of data, required laboratory detection levels, stake-holder groups in the project area, other potential sources of environmental concern in the area, existing land use and general ecology of the area and specific ecologically significant areas.

Task 2 – Fish Sampling: The collection of fish tissue and whole fish samples for analysis of pesticide and lipid content. A total of five fish fillet samples and four to five whole fish samples were collected from each of Oxley's Pond, Pond J, and Pond K. An additional five fish fillet samples and four whole fish samples were also collected from a reference pond. Pond E was selected as the reference Pond for this assessment as it previously did not contain detectable pesticide concentrations in sediment. In addition, this pond is representative of the three selected ponds in terms of similar hydrology, exposure to physical human disturbances such as roadways, and natural sediment composition (i.e. grain size and organic carbon content). As indicated in the PSAP, target fish for this project are trout. Mature, consumable-sized trout were used for the fish fillets and the data used in the human health risk assessment. The whole fish samples comprised mature as well as juvenile sized fish to represent a range of fish sizes that may be eaten by sensitive fish-eating ecological receptors. For the whole fish samples, a composite of numerous juvenile fish was used to represent one whole fish sample.

Task 3 – Sediment Sampling: The collection of sediment samples from an area with detectable pesticide concentrations (based on previous sample results) from each of Oxley's Pond, Pond J, and Pond K at the subject Site. The sediment samples were analysed for pesticide concentrations. A surficial sediment sample was also collected from a reference pond at the subject Site previously identified to have non-detectable

concentrations of pesticides in sediment (reference). For each sediment sampling location, a digital GPS was used to geo-reference each sampling point and transposed to a Site plan for report preparation. The sediment samples were collected using a Ponar dredge capable of collecting sediment samples from 0 to 0.15 metres below the water/sediment interface.

Task 4 – Sediment Invertebrate Evaluation: The collection of sediment samples at selected locations (based on pesticide concentrations exceeding applicable ecological screening benchmarks) for benthic invertebrate analysis. The sediment triad approach, which includes physio-chemical characterization of the sediments, toxicity testing and benthic macro-invertebrate community characterization, was completed as part of the sediment invertebrate evaluation. The objective was to collect data over a range of sediment pesticide concentrations in order to define a dose-response relationship between concentration and effect.

Task 5 – Habitat Evaluation: In concert with the collection of fish and sediments, a survey of the areas of interest was conducted to identify types of aquatic and terrestrial habitat. The selected habitat evaluation identified ecological receptors that occur or are likely to occur within the assessment area. Major plant communities and wildlife associated with each plant community was identified through direct observation during the site reconnaissance and review of distribution maps and documented habitat associations. Historical aerial photographs were also reviewed to identify any current or historical activities within and adjacent to the assessment area that affect the distribution of receptors. In addition, information from the Atlantic Canada Conservation Data Centre (ACCDC) was obtained to identify potential species at risk in the area and sensitive ecological habitat.

Task 6 – Data Analysis and Reporting: Preparation of a detailed report outlining the results of the data collected in terms of comparison to appropriate screening benchmarks together with the results of the HHERA. The ERA portion of the program was conducted in general accordance with the risk assessment process set out in CCME's, *A Framework for Ecological Risk Assessment*, dated 1996. The HHRA program was conducted in general accordance with the risk assessment process set out in Health Canada's, *Contaminated Site Program. Federal Contaminated Site Risk Assessment in Canada. Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), Draft Version 2.0, May 2009 (HC, 2009a), Part II: Health Canada Toxicological Reference Values and Chemical Specific Factors, Version 2.0, May, 2009 (HC, 2009b) and Part V: Guidance on Complex Human Health, Detailed Quantitative Risk Assessment for Chemicals, Draft Version 1, February 2009 (HC, 2009c)*.

It is noted that the quantitative HHERA focuses on pesticides, as these are the only COPCs considered to eb present in the areas currently proposed for redevelopment. Although available data for PHCs from the former area of SCF infrastructure was included at the screening stage (with reference to guidelines from Atlantic Risk Based Corrective Action (RBCA) Version 2.0 for Petroleum Impacted Sites in Atlantic Canada (ARBCA, 2007)), PHCs were not carried forward to quantitative risk assessment.

Based on the results of the HHERA, conclusions and recommendations were made on the requirements for additional investigative activities, and/or risk management and/or remedial measures to address any impacts that currently exist at the Site with the goal of minimizing the net cost of any remedial actions that may be taken.

2.0 CHARACTERISTICS OF THE STUDY AREA

2.1 BACKGROUND

The SCF was in operation for approximately 68 years (since the early 1940s). Site operations ceased and the facility was closed in the early 1990s. The parcel of land assessed is located on Salmonier Line and comprises of 902 hectares. A small portion of the Site, approximately 20%, was historically developed as the SCF facility and consisted of twenty-four buildings and areas of land that were cleared and developed as agricultural fields. Site plans showing the subject property boundary as well as formerly developed and undeveloped areas are presented as Figures 4A to 4D.

Buildings at the facility, which are shown in Figure 4B, were demolished in 2007 and the agricultural fields have not been used since the facility was closed in 2004. Two sanitary landfills and a metals dump were also historically located within the previously developed area of the Site, but were decommissioned in 2007. Based on aerial photograph review, agricultural use of the fields appears to have occurred since at least 1941. The facility and associated buildings were also present at the Site since 1941. The extent of land cleared for fields increased steadily since 1941 and as of 1979, reached its present-day area.

Based on information included in the Phase I/II ESA, vegetable fields were located closer to the developed compound and a wide variety of pesticides and herbicides were applied to the fields throughout the subject property. In addition, former Site employees indicated the field located immediately west of Oxley's Pond was "over" treated with aldrin in approximately 1984. The field was reportedly tested by Agriculture Canada in 1990 and staff were informed that root crops should not be planted in the field. Detectable concentrations of dieldrin were identified in soil samples collected from former agricultural areas of the Site in 2004 and 2009, in particular in areas closest to the former SCF infrastructure (Figures 4B, 4C and 4D).

The remainder of the Site consists of a mix of mature boreal forest, water bodies and bogs/fens, comprising approximately 80% of the subject property (Figures 2 and 4A). There is evidence of forestry related activities (clear cuts) having occurred on-Site in the past. There are also a number of disturbed areas in the form of blow downs located throughout the undeveloped portion of land. Also of note is the encroachment of adjacent properties onto the subject property. The majority of the encroachments are small cabins, or cleared land surrounding cabins, located along the eastern portion of the property boundary.

2.2 TOPOGRAPHY AND DRAINAGE

The undeveloped portion of the Site consists of a mixture of mature boreal forest, water bodies and bogs/fens. Water bodies comprise approximately 30% of the total undeveloped portion of the Site resulting in extensive shorelines. The remainder consists of treed hilly terrain mixing with bogs/fens in the low lying areas. The formerly developed areas of the Site consisted of cleared areas for buildings and sloped agricultural fields on gently rolling hills. Surface drainage is anticipated to be varied throughout the Site and follow local topographic conditions, toward various local ponds.

Several ponds and water bodies on the subject Site, including Pond K, Pond J and Oxley's Pond, are hydraulically connected to Little Gull Pond which is connected to Back River. Back River is a tributary of Salmonier River, which ultimately discharges into the Salmonier Arm of St. Mary's Bay of the Atlantic Ocean.

2.3 ECOLOGICAL SETTING

The Site consists of numerous water bodies, wetlands, fields and forested areas that currently provide habitat and support a diversity of terrestrial, aquatic and semi-aquatic plant and animal species. The Site is located in the Avalon Forest Eco-Region which is a sheltered outlier of the more open and exposed Maritime Barrens Eco-region. Vegetation in the Avalon Forest are typically dominated by balsam fir stands with mixtures of white birch and yellow birch. Black spruce are typically only abundant in wetland areas of this eco-region. Forest stands in the area generally do not exceed 12 metres in height. Fog is frequently present in this eco-region with a mean annual temperature of 5.5 °C. Mean summer temperature is 11.5 °C and mean winter temperature is -1 °C (Memorial University, 2007). The moist climate in the area and ribbed moraine topography give this eco-region its uniqueness with raised bogs occurring between moraines. Arboreal lichens are frequently observed hanging from tree branches and are likely the result of the high fog frequency.

The geology of the Avalon Ecoregion produces surface water systems that are closely tied to groundwater systems (NL Department of Natural Resources, 2010). Many of the larger rivers in the area originate from chains of ponds, such as the ponds observed at the Site. Bogs are widespread in the area and are influenced by the wet marine climate.

Most of the bogs in the area are blanket peatlands consisting of dwarf shrub-sphagnum bogs and sedge-sphagnum bogs (NL Department of Natural Resources, 2010). Fens are also present in the area and are often found in areas with more nutrient rich soils.

Directly east of the Site (east of Salmonier Line) is the Maritimes Barrens Eco-region (Southeast Barrens subregion) which includes the Avalon Wilderness Reserve. This eco-region is characterized by exposed bedrock and extensive barrens containing low-growth plants generally belonging to the heath family. Summers in this sub-region are typically cool with strong winds and winters are relatively mild. Sloped bogs, basin bogs and fens are generally scattered throughout the barrens (NL Department of Natural Resources, 2010).

Both the Avalon Forest and Maritimes Barrens Eco-regions are known to support a wide variety of wildlife including moose (*Alces alces*), lynx (*Lynx Canadensis*), black bear (*Ursus americanus*), red fox (*Vulpes vulpes*), caribou (*Rangifer tarandus caribou*), snowshoe hare (*Lepus americanus*), beaver (*Castor Canadensis*), muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), meadow vole (*Microtus pennsylvanicus*) and masked shrew (*Sorex cinereus*). Fish in this area of Newfoundland include Atlantic salmon (*Salmo salar*), brook trout (*Salvelinus fontinalis*), rainbow smelt (*Osmerus mordax*), American eel (*Anguilla rostrata*) as well as several minnow species.

Additional information on the ecology of the Site as it relates to this project is discussed in Section 6.0.

2.4 GEOLOGY

Soil on the Site was previously identified as brown, silty sand and gravel with numerous cobbles and occasional boulders. The surficial geology of the area has been mapped as of a blanket of diamicton or sand and gravel, 1.5 to 15 m thick, having irregular hummocky topography and relief of 2 to 10 m; hummocks are mainly composed of diamicton, but some contain poorly sorted sand and gravel; diamicton is of similar composition to the till veneer unit; bog is commonly found in low areas between hummocks; this unit was mainly deposited by ice disintegration and stagnation during deglaciation.

The bedrock geology of the area consists of late Proterozoic stratified rocks that consist of sandstone and shall turbidites, including minor unseparated tillite, olistostromes and volcanic rocks from the (Connecting Point and Conception groups) found in the Avalon Zone Units.

2.5 HYDROGEOLOGY

Information on the Site hydrogeology in the previous assessments is limited to groundwater elevation data collected by SNC in 2009. The SNC data indicates groundwater elevations at the Site range from 0.65 metre to 7.5 metres below surface grade. It is noted that the 2009 groundwater elevation data was collected on the same day that the monitor wells were constructed and may not be representative of actual groundwater elevations, had the groundwater in the wells been given more time to equilibrate prior to sampling. Groundwater flow in the area is anticipated to follow Site topography with groundwater discharging to the on-Site ponds.

3.0 REGULATORY FRAMEWORK

The analytical data collected during previous ESAs completed at the Site as well as the 2010 HHERA supplemental sampling program will be compared to applicable guidelines to define areas of contamination as part of the individual ecological and human health risk assessment process (Sections 6 and 7 of this report). The guidelines selected are those used in standard industry practice in Atlantic Canada, which are most appropriate for the intended future land use as a recreational/residential redevelopment. The guidelines listed below are generic guidelines for comparison to sediment and fish tissue data collected as part of the HHERA supplemental sampling program and are included in the analytical data tables for comparison purposes only. Guidelines and references included in the ERA and HHRA evaluations are specifically discussed in Sections 6.0 and 7.0, respectively.

Sediment

Guideline: Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines, Interim Sediment Quality Guidelines (ISQG) and Probable Effect Levels (PEL) for Protection of Aquatic Life, 1999, updated 2011.

Parameters: All parameters.

Rationale: The ISQG typically represents the concentration below which adverse biological effects are expected to occur rarely. PEL Guidelines define the level above which adverse effects are expected to occur frequently in aquatic life receptors.

Fish Tissue

Guideline: Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines, Tissue Residue Guidelines for the Protection of Wildlife Consumers of Aquatic Biota, 1999, updated 2011.

Parameters: All parameters.

Rationale: The tissue residue guideline represents a single maximum concentration of a contaminant in aquatic biota that would not be expected to result in adverse effects on wildlife consumers of aquatic biota.

4.0 HHERA SUPPLEMENTAL SAMPLING PROGRAM

Based on the data collected during the previous ESAs completed between 2004 and 2009, the proposed HHERA supplemental sampling program included the collection of additional sediment and fish tissue data from selected on-Site ponds for pesticides. The supplemental sampling program was outlined in the PSAP and is intended to compliment the historical datasets as well as obtain data necessary to determine if potential pesticide impacts in soil at the Site as well as sediment of the selected on-Site ponds pose a risk to human health or ecological receptors. The work plan therefore included the collection of sediment samples and fish tissue samples from three on-Site ponds (Oxley's Pond, Pond J, and Pond K) previously identified to contain detectable concentrations of pesticides in sediment as well as an on-Site reference pond (Pond E).

As mentioned in Section 1.2, since the proposed cottage development is proposed to occur in former agricultural areas outside the former area of SCF infrastructure, this supplemental sampling program did not include sampling and analyses for PHCs and metals, as these are not considered to be COPCs in areas outside the former infrastructure. If future development is planned for the former SCF infrastructure area, additional assessment will be required to evaluate the PHC and metal COPCs potentially present in this area.

The field sampling program was completed between November 24 and December 8, 2010. The following sub-sections detail the sampling program completed as part of the HHERA supplemental sampling program (aquatic program).

4.1 SEDIMENT SAMPLING PROGRAM

Sediment

On November 24, 2011, a total of four individual sediment samples were collected from the four on-Site pond locations (Oxley's Pond, Pond J, Pond K, and a reference pond (Pond E)) for specific chemical and toxicological analysis. The 2010 CRA sediment sample locations correspond to the 2009 SNC sediment sample locations that previously contained detectable concentrations of specific pesticide compounds (i.e., CRA Sed-9 was collected from the same location as SNC SED-9). As noted in Section 1.3, the reference pond (Pond E) was selected as a pond in the assessment area with similar physical characteristics as the three ponds under investigation but was not known to contain detectable pesticide concentrations in sediment. In addition, the reference pond was considered as being exposed to the same physical disturbances as the three selected ponds (i.e. roadways and other human disturbances) and was not intended to be

representative of a "pristine" pond in the area. The 2010 sediment sample locations are shown on Figure 8.

A boat supplied and operated by CRA personnel was utilized to collect the sediment samples. The four sediment samples were collected utilizing a Ponar dredge sampler and collected from approximately 0 to 0.15 metres depth (of the lake bottom) at each sample location. The samples were placed in sterile laboratory supplied sample containers and maintained in cool storage until delivery to the appropriate laboratory. The sediment samples were shipped to ALS Laboratories in Edmonton, AB for physio-chemical analysis, Aquatox Testing and Consulting Inc. (Aquatox) in Guelph, Ontario, for toxicity testing, and R.A. Currie Biological Consulting Inc. (Currie) in Fredericton, NB for benthic community characterization (i.e. identification of benthic macro-invertebrates).

Based on the results of the sediment sampling program completed by SNC in 2009, additional evaluation of pesticides in the sediments of Oxley's Pond, Pond J, Pond K was completed to determine the potential impact on the macroinvertebrate community (sediment triad evaluation). The three components of the triad approach for sediment evaluation are physio-chemical analysis, toxicity testing, and macroinvertebrate community evaluation. The analytical testing completed on samples collected from each of the four sediment locations (Sed-9, Sed-19, Sed-20, reference pond) therefore includes:

1. Physio-Chemical Analysis - One sample from each pond (4 total) was submitted to ALS for analyses for pesticides, grain size and fraction of organic carbon. ALS is an accredited laboratory with Canadian Association of Laboratory Accreditation (CALA) for pesticide analysis.
2. Toxicity Testing – One sample from each location (4 total) was submitted to Aquatox for benthic invertebrate toxicity testing following Environment Canada's, *Biological Test Method: Test for Survival and Growth in Sediment Using the Larvea of Freshwater Midges (Chironomus tentans or C.riparius) Report EPS 1/RM/32, Ottawa, ON* as well as fish fry toxicity testing following Ontario's Ministry of Environment, *21-Day Fathead Minnow Survival and Bioaccumulation Test: MOE 1992*. Aquatox is an accredited laboratory with CALA for freshwater amphipod growth and survival testing (methodology based on EPS 1/RM/33).
3. Macroinvertebrate Community – Three replicate samples from each pond (12 samples total) were submitted to Currie for macroinvertebrate identification and calculation of community structure metrics (e.g., species density and diversity). CALA does not have an accreditation process for this laboratory analysis.

To prevent any cross contamination, all soil sampling equipment and mixing containers were thoroughly cleaned between sample collection using a detergent solution, followed by several rinses with distilled water and then air-dried. Disposable nitrile gloves were worn by the field staff during sample collection and cleaning procedures.

The 2010 sediment sample locations are identified on Figure 8.

4.2 FISH TISSUE SAMPLING PROGRAM

Between November 29 and December 8, 2010, a fish tissue sampling program was completed as part of the HHERA supplemental sampling program. The target species for this sampling program was brook trout and included the collection of fish for analysis of both fillet and whole fish specimens. Mature, consumable-sized trout were used for the fish fillets and the data used in the human health risk assessment. The whole fish samples comprised of mature as well as juvenile sized fish to represent a range of fish sizes that may be eaten by sensitive fish-eating ecological receptors.

Fish Fillets

Prior to initiating the fish sampling program, background information was gathered from resident anglers as well as Department of Fisheries and Oceans Canada (DFO) personnel on the fisheries in the area. Available information indicates there are currently two resident fishing seasons (winter and summer) for ponds in the subject area. Resident anglers indicated that the majority of fish species caught and consumed during both the summer and winter fishing season are brook trout and occasionally ouananiche (land-locked Atlantic salmon).

Between November 29 and December 8, 2010, a total of 20 representative fish samples were collected from selected areas of Oxley's Pond, Pond J, and Pond K as well as the reference pond. Five brook trout were caught from each of the ponds for fillet analysis. The samples were frozen after sample collection and submitted to ALS for pesticide and lipid analysis. The fish samples were submitted as whole fish and filleted at the laboratory with each fish sample being analyzed by ALS individually. Ouananiche were not captured during the fish sampling program and it this therefore unlikely this species is present in the four on-Site ponds included in this assessment program. Only consumable sized brook trout were therefore submitted for analysis.

Whole Fish

A separate fish tissue sampling program was completed to evaluate the risk to piscivorous wildlife in Oxley's Pond, Pond J, and Pond K as well as the reference pond.

This sampling program included collection of large larger fish samples, which are likely only consumed by larger piscivores (e.g., bald eagle, mink) as well as smaller forage fish that represent the major food source for smaller piscivores in the on-Site ponds.

Between November 29 and December 8, 2010, a total of 19 representative fish samples were collected from Oxley's Pond, Pond J, and Pond K as well as the reference pond, for pesticide analysis of whole fish (muscle, organs, etc.). These fish samples were also frozen after sample collection and submitted to ALS as previously described except the whole fish was blended at the laboratory and the resulting paste analysed for pesticides and lipids. The fish species collected and submitted for whole fish analysis was limited to three or four individual brook trout from each of the four ponds as well as one composite sample containing 30 to 40 minnows and are intended to be representative of fish consumed by piscivorous wildlife in the subject area.

The fish samples (both for fillet and whole fish analyses) were collected by CRA representatives using an aluminum boat, gill nets, and metal minnow traps. The fish nets/traps were typically set late evening and removed from the water early the next morning in an effort to minimize fatalities of fish released. A permit to collect fish by netting for the purposes of scientific evaluation was obtained from DFO prior to initiating the field work.

The 2010 fish sampling locations are shown on Figure 8.

5.0 SUPPLEMENTAL SAMPLING PROGRAM RESULTS

5.1 ANALYTICAL PROGRAM

The 2010 HHERA supplemental sampling program included the collection of four individual sediment samples from four selected on-Site pond locations and 39 fish tissue samples for analysis of pesticides, physical parameters (i.e., grain size), and/or toxicological/ecological parameters. Table 1 summarizes the analytical testing completed as part of the Supplemental Sampling Program.

5.2 SEDIMENT ANALYTICAL RESULTS

On November 24, 2010, a total of four sediment samples (Sed-9, Sed-19, Sed-20, and reference) were collected from Oxley's Pond, Pond J, Pond K, and a reference pond (Pond E), respectively, for analysis of pesticides. Pesticides were not detected in the sediment samples collected from Pond J, or the reference pond (Pond E). The sediment samples collected from Oxley's Pond (Sed-9) and Pond K (Sed-20) contained detectable concentrations of the pesticide compounds, dieldrin and/or heptachlor. Dieldrin was only detected in sediment sample Sed-9 (0.57 µg/kg) collected from Oxley's Pond and the concentration is below the CCME ISQG for freshwater of 2.85 µg/kg. Heptachlor was detected in both the Oxley's Pond (Sed-9) and Pond K (Sed-20) samples with concentrations of 1.42 µg/kg and 0.7 µg/kg, respectively. Both concentrations slightly exceed the heptachlor CCME ISQG guideline of 0.6 µg/kg but are below the PEL guideline of 2.74 µg/kg.

The pesticide analytical data for the four sediment samples collected in 2010 are presented in Table 2. This data has also been included with historical sediment data included in Table B.3 (Appendix B) for comparison purposes. The current and historical analytical data in sediment along with the sediment triad evaluation are further evaluated and discussed in the ERA and HHRA sections of the report (Sections 6.0 and 7.0, respectively). Laboratory certificates are included in Appendix C.

5.3 GRAIN SIZE IN SEDIMENT

A total of four sediment samples (Sed-9, Sed-19, Sed-20, and reference) collected from Oxley's Pond, Pond J, Pond K, and a reference pond (Pond E) were submitted for grain size and organic carbon analysis as part of the 2010 HHERA supplemental sampling program. The results of this testing are presented in Table 3. The sediment samples

collected from Pond J (Sed-19) and the reference pond (Pond E) were comprised of 46 to 65% sand and 35 to 54% silt/clay. The sediment samples collected from Oxley's Pond (Sed-9) and Pond K (Sed-20) were comprised of 3 to 6% sand and 94 to 97% silt/clay.

The organic carbon content in the four sediment samples collected ranged from 5 to 28%.

The grain size and organic carbon analytical data is presented in Table 3 and the laboratory certificates are included in Appendix C.

5.4 FISH TISSUE ANALYTICAL RESULTS

Physical parameters of the fish caught and analysed as part of the fish sampling program are presented in Table 4.

5.4.1 FISH FILLETS

Between November 29 and December 8, 2010, a total of 15 brook trout were collected from Oxley's Pond, Pond J, and Pond K at the Site and analyzed for pesticide and lipid concentrations. Concentrations of 2,4'-DDE, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT alpha-chlordane, dieldrin, endrin, hexachlorobenzene, methoxychlor, mirex and Trans-nonachlor were detected in at least one of the fish fillet samples with the maximum concentration detected being 1.04 µg/kg (wet weight) of 4,4'-DDE. In particular, 4,4'-DDE was detected in all 15 of the fish fillets and ranged in concentration from 0.27 to 5.75 µg/kg (wet weight). Dieldrin was detected in 14 of the 15 fish fillets and ranged in concentrations from non-detect to 1.7 µg/kg. The fish fillet analytical data are presented in Table 5.

During the fish tissue sampling program, a total of five fish (brook trout) were captured from Pond E for analysis of pesticides and lipids in fish fillets. These fish were considered to represent concentrations of pesticides in fish tissue from ponds at the Site that were previously not identified to contain detectable pesticide concentrations in sediment. Detectable concentrations of 4,4'-DDE, dieldrin, and hexachlorobenzene were identified in at least one reference fish fillet sample. In particular, 4,4'-DDE was detected in all 5 of the fish fillets and ranged in concentration from 0.24 to 0.74 µg/kg (wet weight). Dieldrin was detected in 4 of the 5 fish fillets and

ranged in concentrations from non-detect to 0.32 µg/kg. Hexachlorobenzene was only detected in one reference fish fillet sample with a concentration of 0.13 µg/kg. The reference fish analytical data are also presented in Table 5.

5.4.2 WHOLE FISH

A separate fish tissue sampling program was completed to evaluate the risk to piscivorous wildlife in selected on-Site ponds. This sampling program included the collection of representative fish species for pesticide analysis of the whole fish (body burden concentrations). A total of 14 representative fish samples (11 individual brook trout and three composite minnow samples) were collected from Oxley's Pond, Pond J, and Pond K at the Site for pesticide analysis of whole fish (muscle, organs, etc.). Concentrations of 4,4'-DDD, 4,4'-DDE, 4,4'-DDT alpha-chlordane, dieldrin, endrin, heptachlor epoxide, hexachlorobenzene, methoxychlor, mirex and Trans-nonachlor were detected in at least one of the whole fish samples with the maximum concentration detected being 11.1 µg/kg (wet weight) of dieldrin. Dieldrin was detected in 13 of the 14 fish fillets and ranged in concentrations from non-detect to 11.1 µg/kg. 4,4'-DDE was also detected in all 14 of the whole fish samples and ranged in concentration from 0.14 to 10.4 µg/kg. The whole fish analytical data are presented in Table 6.

During the fish tissue sampling program, a total of five whole fish samples (4 individual brook trout and one composite minnow sample) were captured from Pond E for analysis of pesticides and lipids. These fish were considered to represent concentrations of pesticides in whole fish tissue from ponds at the Site that were previously not identified to contain detectable pesticide concentrations in sediment. Concentrations of 4,4'-DDE, dieldrin, endrin, hexachlorobenzene and mirex were detected in at least one of the reference whole fish samples. Both 4,4'-DDE and dieldrin were detected in all 5 of the reference whole fish samples and ranged in concentration from 0.13 to 0.66 µg/kg (wet weight). The reference fish analytical data are presented in Table 6.

The occurrence of measurable concentrations of pesticides in the reference pond is potentially due to use of these chemicals in that watershed or to atmospheric deposition. Atmospheric deposition produces measurable levels of some pesticide compounds in isolated Canadian Lakes and even the Arctic (Muir et al. 1995). Atmospheric deposition appears be the best hypothesis to explain the mirex concentrations observed in the fish of the on-Site Ponds and reference pond. Use of mirex in the watershed of any of these ponds is unlikely since this compound was used primarily to control fire ants in the southern United States. To determine which of these pesticides were likely to be site-related or due to off-site background sources, chemical concentrations in the three

Site ponds were compared statistically to those in the reference pond. Both mirex and a-BHC concentrations in fish from the three Site ponds were similar to those in fish from the reference pond (t-test of log normalized values, $p > 0.05$). Thus, these two chemicals were assumed to be due to background sources and were not considered in the ecological risk assessment. Note that these compounds were only found in parts per billion in fish tissue, and likely would not pose ecological risks at these concentrations irrespective of their source.

The CCME currently has a total DDT tissue residue guideline for the protection of wildlife consumers of aquatic biota of 14 µg/kg (CCME, 2011d). The total concentration of DDT in whole fish samples collected from the three subject ponds as well as the reference pond ranged from non-detectable to 0.88 µg/kg and are well below the CCME guideline.

Results of the whole fish analytical results were used to evaluate risks to piscivorous wildlife that may utilize ponds at the Site using simple food chain models and are further discussed in Section 6.0 of this report.

5.5 ECOLOGICAL ANALYTICAL RESULTS

5.5.1. SEDIMENT TOXICITY TESTING

Freshwater Midge (Chironomus) – 10 Day Survival and Growth

A total of three sediment samples (Sed-9, Sed-19, and Sed-20) were collected from Oxley's Pond, Pond J, and Pond K, respectively, for 10-day survival and growth testing using the freshwater midge *Chironomus dilutus* as the test organism. In addition, one reference sediment sample (reference) was collected from Pond E and analyzed for survival and growth. The mean survival rate for the benthic test organism exposed to the sediment samples collected Oxley's Pond, Pond J, and Pond K ranged from 68 to 96%. The mean survival of the reference sediment sample and laboratory control were 100% and 98%, respectively. Statistical analysis of the dataset indicated that the two samples from Oxley's Pond and Pond K, are not significantly different from the reference or control samples. The mean survival from Pond J is significantly different from the sediment samples collected from Oxley's Pond, Pond K, the reference sample and the control sample.

Fathead Minnow – 21 Day Survival Test

A total of three sediment samples (Sed-9, Sed-19, and Sed-20) were collected from Oxley's Pond, Pond J, and Pond K, respectively, for 21-day survival testing using the freshwater juvenile fathead minnow *Pimephales promelas* as the test organism. In addition, one reference sediment sample (reference) was collected from Pond E and analyzed for fathead minnow survival. The mean survival rate of fish fry exposed to the sediment samples collected Oxley's Pond, Pond J, and Pond K ranged from 95 to 100%. The mean survival of the reference sediment sample was 73%. Statistical analysis of the dataset indicated that the three samples from Oxley's Pond, Pond J, and Pond K are not significantly different from the reference sample.

A dose-response relationship between elevated pesticide concentrations and toxicity tests was not identified for any of the sediment samples. Results of the 10-day chironomus and fathead minnow toxicity testing are presented in Tables 7 and 8, respectively.

5.5.2 BENTHIC COMMUNITY ANALYSIS

A total of three sediment samples (Sed-9, Sed-19, and Sed-20) were collected from Oxley's Pond, Pond J, and Pond K, respectively as well as the reference pond (reference) for invertebrate community diversity analysis. Diversity index values representing the degree of community diversity at each sample location were calculated using the Shannon-Weaver formula for each sample collected. The average diversity index value in Pond J and Pond K were 1.81 and 1.20, respectively. The average diversity index value in the reference pond (Pond E) was 1.36. An average index value of 0.77 was calculated for the sediment samples collected from Oxley's Pond but a significant decrease in the number of macroinvertebrates was identified in this sample. It is noted that the substrate associated with sediment samples from Oxley's Pond were identified as a fine-grained sediment (95% silt and clay) from the grain size analysis. However, during sample collection it was noted Oxley's Pond bottom substrate contained coarse rock material compared to the other ponds and required numerous sampling attempts to retrieve an actual sediment sample. The rocky substrate of Oxley's Pond compared to the other ponds may influence the type and number of invertebrates in the sampling area.

In addition to similar diversity index values between the samples collected from Pond J and Pond K and the reference location, the benthic species present at each sample location (excluding Oxley's Pond) are also relatively similar. The majority of the organisms present in each sample were aquatic worms (e.g., oligochaetes), midge larvae,

and freshwater bivalves. These species are typical organisms in the fine grained sediments of freshwater ponds and lakes. Results of the benthic diversity analysis are presented in Table 9.

5.6 QA/QC PROGRAM

A quality control and assurance program to confirm the validity of the analytical results was applied over the course of the project. The purpose of the quality assurance/quality control (QA/QC) program ensures that the quality of the samples submitted for analyses are representative of the field conditions without interferences from other sources. As such, a sediment sample was collected from an on-Site reference pond and submitted for the same analyses as the subject samples. The QA/QC program also ensures that analytical results are reported accurately and precisely. Due to the limited number of sediment samples collected for analysis and inherent variability with biological samples, blind field duplicates were not collected as part of the 2010 HHERA supplemental sampling program. However, triplicate sediment samples were collected for benthic macro-invertebrate characterization due to the heterogeneity of this sampling media. Similarly, multiple fish tissue samples were collected from each pond to allow for statistical analysis of the dataset. The laboratory also performs their own internal QA/QC program by analyzing duplicate samples.

To prevent any cross contamination during the sediment sampling program, sampling equipment and mixing containers were thoroughly cleaned between sample collection using a detergent solution, followed by several rinses with distilled water and then air-dried. Disposable nitrile gloves were worn by the field staff during sample collection and cleaning procedures.

As part of the QA/QC program, only laboratories accredited by CALA or SCC to complete the required analysis for the specific media were used for the study (as applicable).

6.0 ECOLOGICAL RISK ASSESSMENT

6.1 OVERVIEW

The former SCF property is approximately 902 hectares in size with the majority of the Site being undeveloped land containing a mixture of mature boreal forest, water bodies, and bog/fen wetlands. Water bodies including Oxley's Pond and Little Gull Pond comprise approximately 30% of the total undeveloped property. Approximately 53 hectares of the Site was previously used for operation of the former SCF with 8 hectares historically used for infrastructure and 45 hectares formerly used for farmland and agriculture. The previously developed areas of the Site also provide upland habitat (mixed grassland, shrub and mature coniferous trees) for transient birds and small mammals. The Site is located in the Avalon Forest Eco-Region which is a sheltered outlier of the more open and exposed Maritime Barrens Eco-region which are known to support a wide variety of wildlife.

Based on information provided in the PSAP (SNC 2010), a number of pesticides compounds were identified to be detected or exceed ecological screening values in soil and sediment at the Site. The pesticides included dieldrin in soil and 12 compounds in sediment of three on-Site Ponds (4,4'-DDE, α-chlordane, γ-chlordane, aldrin, dieldrin, heptachlor, heptachlor epoxide, hexachlorobenzene, dichlofluanid, pentachloronitrobenzene, profenophos, propazine). An ecological screening assessment and preliminary quantitative assessment was therefore conducted to determine if the pesticide concentrations in soil and sediment pose a potential risk to ecological receptors at the Site. The ERA was completed in general accordance with A Framework for Ecological Risk Assessment: General Guidance (CCME, 1996) and conducted using a phased approach. The first phase of an ERA is typically a screening assessment, which uses very conservative benchmark concentrations, assumptions and methods to eliminate those constituents that have little, or no, potential to pose risk to ecological receptors. This screening assessment was completed as part of the PSAP. Constituents not eliminated in the PSAP were carried forward to the preliminary quantitative assessment for further evaluation of risk which is outlined in the subsequent sections. As part of the preliminary quantitative ERA, simple food chain models were used to assess potential risk to terrestrial and aquatic receptors from exposure to pesticides.

As part of the overall HHERA program, a supplemental sampling and analysis program was completed in 2010 to obtain the data necessary for refinement of risk estimates. Notably, additional information on pesticide concentrations in sediment and fish tissue from selected on-Site ponds was collected to estimate Site-specific levels of chemical bioaccumulation. In addition, benthic macroinvertebrate surveys and sediment

bioassays were conducted in these same ponds to provide additional evidence for potential effects of pesticides on sediment macroinvertebrates. The additional information allows assessment of potential risks to aquatic receptors exposed to pesticides in sediments and in fish.

This section presents the results of the preliminary quantitative ERA based on previous data collected at the Site together with the sediment and fish tissue analytical data collected as part of the 2010 supplemental HHERA program.

6.2 ECOLOGICAL SETTING

6.2.1 RECEPTOR CHARACTERIZATION

Approximately 53 hectares of the 902 hectare Site was previously used for operation of the former SCF (Figure 2). The remainder of the property is undeveloped land containing a mixture of mature boreal forest, water bodies, and bog/fen wetlands. About 30% of the total area is ponds/lakes. Most of the developed 53 acres were previously used as agricultural fields which are re-naturalizing and considered to be old field habitat. Old field habitat predominantly contains adventive weed species, grasses and forbs, woody shrubs and coniferous saplings. Based on available information the pesticide application at the Site was restricted to these agricultural areas of the Site that are regenerating as old field habitat. Therefore, the ERA focuses on these 53 acres and the adjacent ponds/lakes that potentially received pesticides from overland runoff.

The mixture of old field habitat, undisturbed mature forest, bog/wetlands, and lake habitat likely currently supports a diverse assemblage of plants and wildlife. However, the intended future land use of the Site is redevelopment for cottage lots (approximately 200 cottage lots within the SCF boundary). The available wildlife habitat within the terrestrial areas of the SCF will therefore, potentially be reduced following residential development. Although redevelopment of the Site for residential housing will have negative effects on the habitat quality of the terrestrial areas, a large portion of the terrestrial and riparian areas will remain undeveloped (mix of old field habitat and boreal forest). These undeveloped areas will continue to serve as habitat for terrestrial species pre and post-land redevelopment. In addition, the on-Site ponds and bog/fen wetland habitats will be largely protected from development, and will continue to provide functional habitat for a wide variety of wildlife species.

The ERA therefore assumes that the intended future land use still provides habitat to a wide variety of plants and wildlife. Both semi-aquatic and terrestrial ecological receptors will therefore be the focus of this ERA.

6.2.2 POTENTIAL SPECIES AT RISK

Previous information obtained from the ACCDC regarding the historical and current occurrence of animal and plant species of concern in the Salmonier area was used to determine if potential species at risk occur in the vicinity of the subject Site. The ACCDC database identified four Species at Risk (SAR), under Schedule 1 of the federal Species at Risk Act (SARA) or the provincial Endangered Species Act, as potentially occurring within 1 km of the subject site. The four Schedule 1 species include: boreal felt lichen (*Erioderma pedicellatum*), red crossbill (*Loxia curvirostra*), rusty black bird (*Euphagus carolinus*) and ivory gull (*Pagophila eburnean*). One rare plant species (Acadian quillwort; *Isoetes acadiensis*) was also identified within one kilometer of the subject Site but the plant has not been assessed under SARA or the provincial Endangered Species Act. However, this plant is listed as a priority 1 candidate under Committee on the Status of Endangered Wildlife in Canada (COSEWIC). See Appendix D.

As previously noted, the Avalon Wilderness Reserve is located directly east of the subject Site (east of Salmonier Line). The DOEC lists the reserve as an area protective of the Avalon woodland caribou herd which is the most southerly caribou herd in Canada. This reserve is also known to support boreal felt lichen which is a federally and provincially listed species at risk. The reserve also contains prime habitat for other wildlife species but is not specific to species at risk.

Common Name	***Scientific Name***	***ACCDC Provincial Rank(1)***
Acadian quillwort	*Isoetes acadiensis*	S1
Boreal Felt Lichen	*Erioderma pedicellatum*	S3
Ivory Gull	*Pagophila eburnean*	S2N
Red crossbill	*Loxia curvirostra*	S2S3
Rusty black bird	*Euphagus carolinus*	S3B

Note:
(1) Definitions of provincial ranks are provided in Appendix D.

Acadian Quillwort

Acadian quillwort is not listed under the federal SARA or the provincial Endangered Species Act but its occurrence in Newfoundland is rare. The only reported occurrence of the Acadian quillwort within 1 km of the subject Site was occurred in 1982 with the occurrence being on the west side of Oxley's Pond. The Acadian quillwort is a perennial, non-flowering aquatic plant that lives submerged in ponds and lakes.

Boreal Felt Lichen

Boreal felt lichen is currently listed as a special concern species under COSEWIC and Schedule 1 of SARA, and vulnerable with the provincial Endangered Species Act. The boreal felt lichen is a globally rare species and it has been documented in Atlantic Canada, Sweden, and Norway, but it is currently believed to exist only in Canada. There are two distinct populations: the boreal population (the island of Newfoundland) and the Atlantic population (Nova Scotia and New Brunswick). There area 58 listings of the boreal felt lichen occurring within 1 km of the subject Site with numerous listings reported directly at the Site. The boreal felt lichen grows on the branches or trunks of balsam fir, black spruce, white spruce, or very occasionally red maple trees. The presence of the boreal felt lichen is therefore likely restricted to forested areas of the subject Site.

Ivory Gull

The ivory gull is listed as endangered under COSEWIC, the provincial Endangered Species Act and under the SARA. The only reported occurrence of the ivory gull within 1 km of the subject Site occurred in 1998 with the occurrence being in the Salmonier Nature Park. The ivory gull is a small seabird with black legs and nests at certain specific sites in the High Arctic. In Canada, the species breeds exclusively in Nunavut, where there is permanent drift ice and open water. The wintering grounds of the ivory gull are poorly known, but they are thought to be along the southern edge of the pack ice in the North Atlantic and North Pacific oceans. The ivory gull spends the winter on the pack ice of Davis Strait, the Labrador Sea, the Strait of Belle Isle and the northern Gulf of St. Lawrence. It is occasionally seen along the eastern coasts of Newfoundland and Labrador, particularly the Great Northern Peninsula of Newfoundland, and on the Lower North Shore of Quebec. As such, the habitat to support the wintering and nesting requirements of the ivory gull is generally lacking at the subject Site.

Red Crossbill

The red crossbill is listed as endangered under COSEWIC, the provincial Endangered Species Act and under the SARA. The only reported occurrence of the red crossbill within 1 km of the subject Site occurred in 1971 with the occurrence being in the vicinity of the Salmonier Line. Red crossbills are medium-sized birds that can be readily

recognized by the crossed mandibles that give them their name. In Canada, the species ranges from British Columbia to the Maritimes and the island of Newfoundland, but nests of the *percna* subspecies have been found in Newfoundland only. Red Crossbills are highly specialized for conifer habitats and mature forests that produce abundant cones. Habitats that furnish the red crossbill *percna* subspecies with conifer seeds are large, mature black spruce and balsam fir stands. The bird also roosts and nests in coniferous tree stands. The previously undeveloped portions of the subject Site have well developed coniferous tree stands that could be used as habitat by the red crossbill.

Rusty Blackbird

The Rusty Blackbird is currently listed as a species of special concern under COSEWIC, vulnerable under the provincial Endangered Species Act, and a species of special concern under the SARA. The only reported occurrence of the rusty blackbird within 1 km of the subject Site occurred in 2005 with the occurrence being in the Salmonier Nature Park. The Rusty Blackbird is a thrush-sized passerine that occurs in all Canadian provinces and territories. The Rusty Blackbird nests in the boreal forest and favours the shores of wetlands such as slow-moving streams, peat bogs, marshes, swamps, beaver ponds and pasture edges. In wooded areas, the Rusty Blackbird only rarely enters the forest interior. The previously undeveloped portions of the subject Site have well developed coniferous tree stands together with the numerous ponds and wetlands on the Site that could be used as habitat by the rusty blackbird.

Information obtained from the ACCDC database in relation to the Site is included in Appendix D.

6.2.3 VALUED ECOSYSTEM COMPONENTS

Valued ecosystem components (VECs) are defined as those "*environmental attributes or components identified as a result of societal values and considerations*" (CCME, 1997). VECs should have at least one, but preferably several of the following characteristics:

- Are important to human populations
- Have economic and/or social value
- Have intrinsic ecological significance
- Are sufficiently sensitive to anthropogenic activities that they can serve as a baseline from which potential impacts can be evaluated

A variety of VECs were identified in the PSAP (SNC, 2010) based on consideration of the habitat and local species assemblages. After consideration of the fate, toxicity, and distribution of the compounds of potential ecological concern (COPECs), these initial VECs were revised as follows. First, bats and swallows were included as representative of aerial insectivores that could potentially be exposed to chemicals in aquatic insects emerging from on-Site pond sediments. Terrestrial plants and lichens were eliminated from the VEC list since dieldrin is not considered toxic to plants and areas with stressed vegetation was not observed during the 2010 supplemental sampling program (ATSDR, 2002). Similarly, it is assumed dieldrin is not toxic lichens but toxicological data for lichen exposure to dieldrin is limited in literature. Other VECs proposed by SNC (e.g., osprey, moose) were eliminated since their potential risks are represented by VECs with similar diets. For example, risks to the herbivorous moose will be less than those for meadow voles because the latter's home range is smaller than the Site.

Fish and amphibian species are considered VECs at this Site but were not further evaluated in the quantitative ERA for the following reasons:

- the primary contaminant exposure pathway to these organisms is generally considered to be through direct exposure to water and pesticides were not detected in on-Site surface water
- toxicity testing completed on fish fry exposed to sediment samples collected from the Site indicated that on-Site sediment is not toxic to fish
- toxicological data for these wildlife species from exposure to pesticides in sediment is limited in literature
- total concentration of pesticides identified in fish tissue samples collected from the Site are very low (parts per billion (ppb) range) and are similar to concentrations of various pesticides detected in fish tissue throughout North America (ATDSR, 2002; Jorgenson, 2001)

The final list of VECs is presented below along with the feeding guilds and conservatively assumed diets.

Species	***Scientific Name***	***Feeding Guild***	***Assumed Food***
	Terrestrial Habitat		
Short-tailed Shrew	*Blarina brevicauda*	Primary Predator	100% Earth
Robin	*Turdus migratorius*	Omnivore	50% Worms/50% Vegetation
Meadow Vole	*Microtus pennsylvanicus*	Herbivore	100% Vegetation
Pine Grosbeak	***Pinicola enucleator***	Herbivore	100% Vegetation
Ermine	***Mustela erminea***	Top Predator	100% Small Vertebrates
Red Fox	*Vulpes vulpes*	Top predator	100% Small Vertebrates
Red-tailed hawk	*Buteo jamaicensis*	Top predator	100% Small Vertebrates

Species	*Scientific Name*	*Feeding Guild*	*Assumed Food*
	Aquatic Habitats		
Mink	*Mustela vison*	Piscivore	100% Fish
Great Blue Heron	*Ardea herodias*	Piscivore	100% Fish
Kingfisher	*Ceryle sp.*	Piscivore	100% Fish
Raccoon	*Procyon lotor*	Herbivore/Benthivore	50% Aquatic Benthos
Mallard	*Anas platyrhynchos*	Herbivore/Benthivore	50% Aquatic Benthos
Brown Bat	*Myotis lucifugus*	Aerial Insectivore	100% Aquatic Benthos
Tree Swallow	*Tachycineta bicolor*	Aerial Insectivore	100% Aquatic Benthos

6.2.4 TARGET CONSTITUENTS

Previous investigative studies completed at the Site identified a number of banned or highly restricted organochlorine (OC) pesticides as COPECs in soil and sediment. These include dieldrin in soil, sediments, and fish. DDT and various metabolites (hereafter referred to as Total DDT) were also detected in sediments and fish, as were various isomers of total chlordane (α-chlordane, γ-chlordane, nonachlor), heptachlor and heptachlor epoxide, hexachlorobenzene, and methoxychlor. These were included as COPECs in sediments because they exceeded conservative sediment quality benchmarks (e.g., ISQGs). Some current use pesticides such as dichlofluanid, pentachloronitrobenzene, profenophos, and propazine were also detected at very low concentrations in sediments. These pesticides generally do not have available sediment benchmarks and were therefore included as COPECs.

6.2.4.1 FATE, TRANSPORT, AND ECOTOXITY OF COPECS.

Most of the COPECs are banned or highly restricted OC pesticides and tend to be sparingly soluble, hydrophobic substances that, therefore, bind tightly to soil and sediments (ATSDR, 2002; Jorgenson, 2001). Consequently, these chemicals do not move readily through groundwater, and except for soil erosion, tend to remain localized in the surface soils to which the chemicals were applied.

However, if contaminated surface soils erode and are transported overland via surface flow during storm events, the OC pesticides in soils can be transported to nearby surface waters and ultimately become deposited in sediment. It is assumed that some, if not all, of the agricultural areas at the Site were plowed which would facilitate soil erosion and wind-driven transport of dust and sorbed pesticides during bare ground periods. These OC chemicals were also typically applied aerially in sprays and mists, so nearby lakes

and ponds could have been directly contaminated during application by wind-driven dispersion. Once in the surface water, these hydrophobic, long-lived chemicals tend to persist in bottom sediments.

In terms of ecotoxicity, the OC pesticides are notable for two properties, which were likely the reasons for their banning. First, OC pesticides tend to be very persistent in the environment. Half-lives for more persistent organochlorines (e.g., total DDT, total chlordane, dieldrin) in soil and lake sediments range from 5 to 20 years or longer. Second, several of the OC pesticides (dieldrin, aldrin, total DDT, total chlordane, hexachlorobenzene, heptachlor and heptachlor epoxide) readily bioaccumulate and may biomagnify in food chains(ATSDR, 2002; TCEQ, 2006). This high bioaccumulation potential means that concentrations of OC pesticides tend to increase in higher levels of the food chain. Hence, very low abiotic concentrations can produce ecologically significant concentrations at higher food chain levels. Thus, food chain exposure may be a more important route of exposure than direct exposures from abiotic media (soil, sediments, water), and predators at the top of food chains tend to be more highly exposed than biota lower in the food chain.

The other COPECs is sediment such as dichlofluanid, pentachloronitrobenzene, profenophos, and propazine are currently regulated pesticides that are not typically persistent in the environment and generally do not significantly bioaccumulate or biomagnify (TCEQ, 2006). Thus, they are toxic more from direct exposure than from indirect food chain exposure.

6.2.4.2 COMPLETE EXPOSURE PATHWAYS

A complete exposure pathway must have the following components: (1) an anthropogenic (human) source of a chemical constituent, (2) a mechanism for transport of the constituent from the source to one or more ecological receptors, and (3) exposure of ecological receptors to the constituent (exposure route).

The screening assessment evaluated all data from surficial soil samples, which are those soils collected from a depth of 0.3 metre below ground surface, or less. Evaluation of risk to the terrestrial receptors is considered to be representative of both existing Site conditions and future land use as a residential area with some undeveloped areas. Potentially complete exposure routes for terrestrial ecological receptors associated with the Site and adjacent shoreline areas are:

- Direct contact and potential absorption of dieldrin in soil macroinvertebrates

- Direct contact and absorption of dieldrin in soil by plants
- Incidental ingestion of soil by vertebrates (insectivores, herbivores, and carnivores)
- Ingestion by herbivores of dieldrin bioaccumulated by plants
- Ingestion by predators of worms, which have bioaccumulated dieldrin
- Ingestion by predators of small vertebrates, which have bioaccumulated dieldrin

Potentially complete exposure routes for aquatic and semi-aquatic ecological receptors associated with the on-Site ponds are:

- Direct contact of benthic macroinvertebrates and other aquatic life to COPECs in sediments
- Ingestion by upper trophic level organisms of benthic prey, which have bioaccumulated COPECs from sediments
- Ingestion by semi-aquatic predators of fish, which have bioaccumulated COPECs from sediments and prey

This screening assessment did not consider exposure of ecological receptors to groundwater or surface water to be a complete exposure pathway as pesticides were not previously detected in groundwater samples collected from the Site or from surface water samples collected from on-Site ponds.

The potential risks posed by bioaccumulative COEPCs only pertain to the OC pesticides as currently regulated pesticides such as dichlofluanid, pentachloronitrobenzene, profenophos, and propazine are not considered to be bioaccumulative (TCEQ, 2006). A Conceptual Site Model for the ecological receptors is presented as Figure 9.

6.2.5 ASSESSMENT AND MEASUREMENT ENDPOINTS

6.2.5.1 ASSESSMENT ENDPOINTS

Assessment endpoints for this risk assessment focused on terrestrial organisms that would potentially be exposed to dieldrin in soil. Thus, the terrestrial assessment endpoints are:

1) Maintenance of viable populations of vertebrate herbivores

2) Maintenance of viable populations of vertebrate primary predators (e.g., worm-eaters)
3) Maintenance of viable populations of top predators (e.g., carnivores)

For the aquatic communities of the on-Site ponds, the assessment endpoints are:

1) Maintenance of the aquatic invertebrates in sediment
2) Maintenance of the aquatic and semi-aquatic predators of sediment invertebrates
3) Maintenance of the aerial insectivores feeding on adult benthic insects
4) Maintenance of the semi-aquatic piscivorous wildlife populations

6.2.5.2 MEASUREMENT ENDPOINTS

A measurement endpoint is a quantifiable parameter that responds to the stressor (i.e., chemical) and describes or measures characteristics that are essential for the maintenance of the assessment endpoint. Measurement endpoints can range from biochemical responses to changes in community structure and function. Given the assessment endpoints chosen above, the following are appropriate measurement endpoints for the terrestrial habitats:

- Dieldrin concentrations in worms and soil invertebrates that do not pose ecologically significant reductions in reproduction or growth of primary predators
- Dieldrin concentrations in terrestrial plants that do not pose ecologically significant effects on herbivorous vertebrates
- Dieldrin concentrations in small vertebrate prey that do not cause reductions in the reproduction of top predators such as ermine, fox, and hawks

The following are measurement endpoints for the on-Site ponds consistent with the assessment endpoints identified above:

- Pesticide concentrations in aquatic invertebrates that do not cause toxicity to predators of benthic invertebrates (e.g., ducks, raccoons, bats, swallows)
- Pesticide concentrations in fish that do not cause toxicity to fish-eating wildlife such as kingfishers, mink, and great blue herons
- Pesticide concentrations in sediments that do not cause toxicity to aquatic benthos

The potential risks for these measurement endpoints will be quantified with the quotient method. Specifically, screening quotients (SQ) are estimated as

$$SQ = \frac{EEC}{ESV}$$

where EEC is the estimated exposure concentration and ESV is the ecological screening value, also a concentration. The ESV is a specific chemical concentration below which effects to ecological receptors are considered unlikely. In contrast to previous screening assessments where the EEC was based on the maximum concentration, the EEC in this phase of the ERA is based on the 95% upper confidence level (UCL) of the mean. The 95% UCL is an upper bound estimate of the mean exposure concentration. Compared to the maximum concentration, the 95% UCL concentration is more representative of the exposure faced by the population of organisms inhabiting the Site and/or the average exposure experience by wildlife that may visit various areas of the Site.

An SQ less than 1.0 indicates that the contaminant alone is unlikely to cause adverse ecological effects and does not require additional evaluation. A SQ greater than one (e.g., the UCL concentration exceeds the ESV) indicates there may be a potential for risk to ecological receptors and further evaluation is required.

A variant of the above equation is used to estimate risks to ecological receptors via bioaccumulation and food chain exposure. In this case, a hazard quotient (HQ) is calculated as the estimated total daily exposure divided by the toxicological reference value (TRV), both of which are doses (mg/kg-day). In the last case, the measurement endpoint will be assessed by estimating exposure from various sources (e.g., food, incidental soil ingestion) for various VECs.

6.3 BENTHIC INVERTEBRATE EVALUATION

The sediment triad approach was utilized to evaluate potential risks to macroinvertebrates in on-Site ponds exposed to detectable concentrations of COPECs. The sediment triad approach uses a weight of evidence methodology to evaluate potential risks and includes: comparison of chemical concentrations to chemical benchmarks (physio-chemical characterization, sediment toxicity testing and benthic macroinvertebrate community characterization (i.e., density and diversity analysis)).

6.3.1 PHYSIO-CHEMICAL CHARACTERIZATION

A total of 27 sediment samples were collected from the on-Site ponds between 2004 and 2010. In the PSAP, risks were determined by comparing the maximum sediment concentration to the most conservative sediment benchmark. The physio-chemical analysis (or re-screening) outlined below will, in contrast, compare the maximum and mean sediment concentration against tiered sediment benchmarks. This tiered approach for screening of chemical concentrations to sediment benchmarks provides a more realistic prediction of potential toxicity.

Except for heptachlor and heptachlor epoxide, sediment benchmarks were obtained from the CCME Sediment Quality Guidelines if available (CCME, 2011c). The CCME guidelines provide lower tier or very conservative ISQGs, which are analogous to threshold effect level benchmarks (TELs), and less conservative, upper tier, probable effect level (PEL) benchmarks. Both CCME sediment benchmarks are conservative, co-occurrence sediment quality benchmarks (Co-SQBs). The CoSQB methodology relies on the co-occurrence of sediment toxicity with observed chemical concentrations. However, this co-occurrence methodology does not identify the actual causal agent for observed toxicity. In most cases with pesticides (and most metals), chemical concentrations are too low to pose toxicity (Smith and Jones, 2005; Smith, 2007; Smith 2008). Thus, the co-occurrence methods tend to resemble background concentrations rather than concentrations that actually cause toxicity.

It is generally acknowledged that the background levels of pesticides in sediments throughout North America tend to be orders of magnitude lower than potentially toxic level. As such, the US Environmental Protection Agency estimated a dieldrin sediment quality benchmark of 11 µg/g organic carbon based on extensive aquatic toxicity data and equilibrium partitioning (USEPA, 2003). Even for carbon poor sediments of 1%, this value translates to a bulk sediment concentration of 110 µg/kg, which is approximately 100 times the ISQG. Similarly, as will be shown below, sediment criteria for heptachlor and heptachlor epoxide are orders of magnitude higher than CCME ISQG and PELs when equilibrium partitioning approach is used to evaluate potential risks to benthic invertebrates.

For OC pesticides such pentochloronitrobenzene, profenophos, and propazine which do not have CCME ISQG or PEL sediment benchmark values or in the case of heptachlor and heptachlor epoxide, TEL equivalent sediment benchmarks were generated with information on water toxicity, equilibrium partitioning theory (USEPA, 2003), and an assumption that the sediments have 5% organic carbon (the organic carbon content in the four sediment samples collected from on-Site ponds ranged from 5 to 28%). Thus,

sediment quality benchmarks for heptachlor and heptachlor epoxide were based on an acceptable water concentration of 0.52 µg/L (USEPA, 1980). The two compounds have partition coefficient (Koc) values of $9.53x10^3$ and $2.03x10^5$, respectively. Together, these values produce sediment benchmarks of 248 µg/kg and 5278 µg/kg for heptachlor and heptachlor epoxide, respectively. Probable effect level benchmark values were also estimated to be three times these TEL values.

Sediment quality criteria for pentochloronitrobenzene were based on aquatic toxicity data presented in USEPA Region III sediment benchmarks (USEPA, 2006). This source reports a lowest chronic no-observed effect concentration (NOEC) and lowest observed effect concentration (LOEC) of 13 µg/L and 30 µg/L respectively. Pentachloronitrobenzene has a Koc value of $3.2 x10^4$. At 5% organic carbon in the sediments, these parameters produce a TEL sediment quality value of 20,000 µg/kg and PEL sediment quality value of 50,000 µg/kg.

Profenophos (or profenofos) is considered to be very toxic to fish and aquatic invertebrates with acutely lethal concentrations (LC50) ranging from 7.7 µg/L to about 6000 µg/L. A worst-case chronic NOEC value of 0.77 µg/L is derived for profenophos with a ten-fold acute to chronic uncertainty factor applied to the lowest LC50 value. Profenophos has a Koc value of 2000 (Vogue et al. 1994). These values produce a TEL sediment quality benchmark of 77 µg/kg. Probable effect level benchmark values were also estimated to be three times these TEL values.

Propazine is classified as moderately to slightly toxic with acute LC50 values ranging from about 5,000 to 40,000 µg/L. A worst-case NOEC value of 500 µg/L is derived for propazine with a ten-fold acute to chronic uncertainty factor applied to the lowest LC50 value. Propazine has a log Koc of 154. At 5% organic carbon, these values produce a TEL sediment benchmark of 3850 µg/kg.

Hexachlorobenzene is not considered to be toxic to aquatic invertebrates as the water solubility of this compound is below its estimated toxicity (Barber et al., 1997; Fuchsman et al., 1998). This COPEC was therefore assumed to be non-toxic to aquatic benthos.

Based on the above rationale, maximum and 95% UCL of the mean sediment concentrations in all the ponds were re-screened against these sediment benchmarks. Screening of the detected pesticides in sediment is summarized in Table E1 (Appendix E), which identifies the number of samples, frequency of detection (FOD), maximum concentration, 95% UCL of the mean concentration, screening benchmark, and screening quotient. Comparison of the maximum and 95% UCL sediment concentration to ISQG (or calculated equivalent TEC) and PEL benchmarks

identified SQ's approximately equal to or well below a value one. This physio-chemical characterization of detected chemicals in sediments demonstrates that pesticide concentrations in sediment do not pose an unacceptable risk to benthic invertebrates.

6.3.2 TOXICITY TESTING

As discussed in Section 5.5.1, the mean survival rate for the benthic test organism exposed to the sediment samples collected Oxley's Pond, Pond J, and Pond K ranged from 68 to 96%. The mean survival of the reference sediment sample and laboratory control were 100% and 98%, respectively. Statistical analysis of the dataset indicated that the two samples from Oxley's Pond and Pond K, are not significantly different from the reference or control samples.

Although the mean survival and growth rate for the test organism exposed to sediment from Pond J is significantly different from the sediment samples collected from the other on-Site ponds and the control, a dose-response relationship between pesticide concentration and toxicity was not identified as sediments from Pond J did not contain detectable pesticide concentrations.

6.3.3 COMMUNITY CHARACTERIZATION

The third component of the sediment triad approach is the characterization of the benthic macroinvertebrate community. In this component, macroinvertebrates were collected from three on-Site ponds that correspond to the sampling stations for chemical analysis and toxicity testing (i.e. sample locations Sed-9, Sed-19, and Sed-20) and the reference location.

Shannon-Weaver Diversity Index (DI) values representing the degree of community diversity at each sample location was calculated using the formula:

DI = -sumN/NT x LogN/NT

where N is the number of individuals of a species and NT is the total number of organisms in the sample. The DI values for the sediment samples collected from Pond J, Pond K and the reference pond (Pond E) ranged from 1.11 to 1.88. However, the DI values for the sediment samples collected from Oxley's Pond ranged from 0.56 to 1.04 with a significant reduction in the total number of macroinvertebrates compared to the other three on-Site ponds (see Table 9).

6.3.4 RISK CHARACTERIZATION – SEDIMENT BENTHOS

The triad evaluation is intended to provide multiple lines-of-evidence to determine if chemical constituents in sediment pose a risk to sediment dwelling benthic organisms. Comparison of the maximum and 95% UCL sediment concentrations to conservative ISQG benchmark or calculated equivalent TEL sediment benchmarks identified SQ's approximately equal to or below one. The SQs for the less conservative PEL benchmark were all well below one. An SQ less than one is indicative of a chemical concentration that presents a low risk to benthic invertebrates. The physio-chemical characterization of detected chemicals in sediments demonstrates that pesticide concentrations in sediment do not pose an unacceptable risk to benthic invertebrates.

Similarly, the results of the laboratory toxicity testing did not identify a correlation between pesticide concentrations in sediment and benthic survival/growth rates. Although decreased survival and growth rates were observed for the benthic test organism in the sediment sample collected from Pond J, this sediment sample did not contain detectable concentrations of pesticides. The reduced survival and growth rate in this sample is therefore not considered to be related to pesticide concentrations but the causative agent is not known. A potential relationship between ammonia concentration in the sediments and survival/growth rates was, however, observed suggesting anoxic or reducing conditions of the sediment may affect toxicity to the test organisms (Table 7).

The DI values for the sediment samples collected from Pond J, Pond K and the reference pond (Pond E) were relatively similar and a relationship between elevated pesticide concentrations and low benthic diversity index values was not identified between these samples. However, the DI values for the sediment samples collected from Oxley's Pond along with the total number of macroinvertebrates were significantly reduced compared to the other three on-Site ponds. The reason for the reduced benthic diversity is not known. However, sediment toxicity testing and physio-chemical analysis of pesticides in sediments both indicated that Oxley's Pond sediments are not toxic to benthic organisms. The reason for the reduced benthic diversity may be related to rocky substrate observed in this pond during the 2010 supplemental sampling program.

Based on the multiple lines of evidence provided as part of the sediment triad evaluation, pesticide concentrations of the three on-Site ponds tested as part of the 2010 sampling program as well as the reference pond present a low risk the benthic invertebrate community of these ponds.

6.4 VERTEBRATE SPECIES EVALUATION

Potential risk to upper trophic level ecological receptors due to concentrations of OC pesticides in soil, sediment and fish tissue was evaluated using simple food chain models for upper trophic level organisms. With the food chain model approach, ingestion of bioaccumulative OC pesticides by key functional and taxonomic groups of receptors was estimated. The estimated ingestion, or exposure, was then compared to toxicological benchmarks identified in guidance documents for ecological risk assessment. The functional and taxonomic groups of receptors evaluated were terrestrial mammalian and avian herbivores, insectivores, omnivores, and top predators (e.g. carnivores) as well as semi-aquatic avian and mammalian piscivores, insectivores and omnivores.

6.4.1 EXPOSURE ASSESSMENT

Because it is not practical to evaluate the effects of constituents of concern for all species that potentially occur in terrestrial and aquatic areas of the Site, indicator species were used to represent ecological guilds, or groups of organisms within a taxonomic rank of the same trophic level. Furthermore, exposure factors and toxicological benchmarks have been identified for indicator species, which allows for evaluation of risk with a limited number of assumptions.

For this preliminary quantitative assessment, seven terrestrial indicator species were selected to evaluate risk due to dieldrin in soil at the Site and seven semi-aquatic species were selected to evaluate risk due to OC pesticides in sediment and fish tissue of on-Site ponds (See Section 6.2.3 and Table E2 of Appendix E). The short-tailed shrew and meadow vole were selected to represent the guild of omnivorous and herbivorous terrestrial mammals, respectively. The robin and pine grosbeak were selected to represent the guild of omnivorous and herbivorous terrestrial birds, respectively. The ermine, red fox and red-tailed hawk were used to represent the guild of top predatory mammals and birds (e.g. carnivores). The mallard duck and great blue heron were selected to represent the guild of herbivorous/insectivorous and piscivorous semi-aquatic birds, respectively. In addition, the kingfisher was selected to represent the guild of piscivorous birds that consume smaller sized fish than the great blue heron. Both the great blue heron and the kingfisher are intended to represent piscivorous birds. The raccoon and mink were selected to represent the guild of herbivorous/insectivorous and piscivorous semi-aquatic mammals, respectively. The brown bat and tree swallow are selected to represent the guilds of aerial mammalian and avian insectivores, respectively.

To be conservative, the potential food chain exposure to COPECs were modeled using worst-case assumptions. That is, these receptors were assumed to eat only contaminated food from the Site for their entire lives. For example, shrews were assumed to eat only worms from the Site, and the aerial insectivores (bats and swallow) were assumed to eat only aquatic insects emerging from the on-Site Ponds. The total exposure for each species was modeled as:

Total Dose = [food] * consumption rate * absorption efficiency + [soil/sediment] * incidental soil/sediment consumption rate * absorption efficiency + [water] * drinking rate * absorption efficiency + [air] * inhalation * absorption efficiency + [soil/sediment] * dermal absorption rate + [airborne dust] * dust inhalation * absorption efficiency.

All bracketed terms (e.g., [water]) refer to the concentration of the chemical in that medium; other values are self-explanatory. Based on the conservative approach, absorption efficiency was assumed to be 100 percent for all pathways. However, as pesticides were not detected in on-Site surface water samples, water ingestion is considered to be insignificant and not included in the total dose calculation. Similarly, exposure to ecological receptors via air, dermal absorption, and airborne dust is considered to be insignificant in ecological risk assessment and therefore also not included in the total dose calculation. Consequently, the total dose equation collapses to:

Total Dose = [food] * consumption rate + [soil/sediment] * incidental soil/sediment consumption rate.

Species-specific ingestion rates were taken from data supplied in USEPA (1993) or other sources (e.g., Baron et al., 1999), when available. If specific ingestion rates were not available, rates were estimated from consumption-body mass (allometric) models as per USEPA (1993). These food chain parameters for each VEC are listed in Table E2 of Appendix E.

6.4.2 EFFECTS LEVEL

After exposures were estimated with the food chain models, these exposures are then compared to toxicological reference values (TRVs). Toxicological reference values are doses of chemical constituents (rates of ingestion expressed as mg/kg body weight per day) that represent a no adverse effects level (NOAEL) or lowest adverse effects level (LOAEL) to a particular organism. The TRVs for COPECs included in this ERA

evaluation were taken from several literature sources (e.g., Sample et al., 1996; USEPA, 2007a) with the NOAELs and LOAELs for each COPEC included in Table E3 of Appendix E along with the associated literature source. In general, the most conservative TRV cited in the referenced literature for each indicator species was used in the preliminary quantitative assessment.

6.4.3 EXPOSURE CONCENTRATIONS

6.4.3.1 TERRESTRIAL PREY AND PLANTS

Exposure to each indicator species was estimated by calculating a species-specific dose using modeled and measured prey tissue concentrations (if available), food consumption rates, and water ingestion rates. Dieldrin is the only COPEC in surface soils, and this chemical will bioaccumulate in plants and terrestrial prey species. The concentrations of dieldrin in plants can be estimated with widely-used regression models (Travis and Arms, 1988). The plant uptake factors, on a dry weight plant to dry weight soil basis, are calculated using the equation:

Log10 BCF = 1.588 - 0.578 x Log10 Kow

The log octanol-water coefficient (Kow) for diedrin is reported to be 4.5 by the USEPA (USEPA, 2005), which produces a bioconcentration factor (BCF) of 0.097 on a dry weight plant basis. This BCF can be converted to wet weight BCF by assuming plants are 85% water (USEPA, 1993), which yields a wet weight plant to dry weight soil BCF of 0.015. Thus, wet weight plant concentrations are estimated to be 1.5% of the concentrations found in soils.

The concentration of pesticides in earth worms at the Site was estimated with the model of Menzie et al. (1992).

Worm tissue concentration = PW * % lipid * 10 Log K_{ow}
where:

PW = Pore water concentration in soil;

$$PW = \frac{[Soil]}{x * (K_{ow})^{m} * f_{oc}};$$

x = empirical constant (0.66);

m = empirical constant (1.029);

K_{ow} = octanol-water partition coefficient (unitless);
f_{oc} = percent organic carbon in soil; and
[Soil] = concentration of chemical in soil.

Earthworms are generally considered to be approximately 1 to 2% lipid, on a wet weight basis (e.g., see Hebert et al., 1994). Surface soils generally contain 1 to 10% organic carbon (Agriculture Canada, 1995). As such, intermediate values of 1.5% lipid in worms and 5 percent organic carbon in soils, were assumed in the modeling. This suggests that worms will have about 1/3rd the concentration as the soils in which they live.

To account for the potential biomagnification potential of dieldrin, dieldrin concentrations in small mammals was based on a food chain multiplier estimated by USEPA (USEPA, 2007b). According to empirical data, organisms tend to have about 1.2 times dieldrin concentrations as those in the foods that they consume. Small mammal populations tend to be about 80% herbivorous species (voles, mice, rats, rabbits) and 20% primary predators like shrews. These ratios are based on review of the small mammal literature, which suggests that the shrews generally make up about 20% of the small mammals captured in traps[1] (Menzel et al. 1997; Loeb 1999; Manson et al. 1999). The same relative distribution of herbivores and primary predators was assumed for small birds. Thus, the dieldrin concentrations in the population of small vertebrate prey is the sum of:

1.2 * 80% * Plant Uptake * soil conc. + 1.2 * 20% * Worm Uptake * soil conc.

Since plants have about 1.5% of soil concentrations and worms have about 34% of soil concentrations, this equation suggests that small vertebrate prey will have about 10% of the dieldrin concentrations, on a wet weight basis, as the underlying soils on a dry weight basis.

All of the estimates above rely on known or estimated concentrations of dieldrin in on-Site soil. However, the current concentrations of dieldrin in soil at the Site is somewhat uncertain. The available dataset is a compilation of samples collected in 2004 and in 2009. The 2009 samples covered a wider range of the Site and, thus, would appear to be more representative of the entire area. In addition, the 2009 samples yielded much lower concentrations of dieldrin than those measured in 2004. Only some of this difference can be attributed to different areas sampled. Most 2004 sample

[1] This estimate has two layers of conservatism. Capture of small mammals is thought to depend on their activity rates, so a higher capture rate for shrews would be expected. In addition, shrews tend to be smaller than the other rodents, especially the rats and voles. Thus, their contribution to total prey biomass is lower than their contribution to total prey numbers.

locations were effectively re-sampled in 2009 with nearby samples, and these nearby samples had, on average about 1/10th the concentrations of dieldrin as the 2004 samples. One of the differences is likely attributed to fate processes. The typical half-life quoted for dieldrin in soil is approximately 5 years (UNEP, 1989). Given this ambiguity, maximum, mean, and 95% UCL soil concentrations were estimated based on all data and for 2009 samples only (Table E4). Similarly, dieldrin concentrations in biota were also estimated with all soil samples and only 2009 data.

6.4.3.2 AQUATIC PREY

The concentrations of COPECs in aquatic food (i.e., aquatic invertebrates, small forage fish, and large forage fish) can be estimated with COPEC concentrations measured in fish. Originally, the intent was to distinguish COPEC concentrations between small fish (i.e., minnows) and larger forage fish (small brook trout) to estimate exposure to predators of these different sized fish. However, COPEC concentrations in both sizes of fish tended to be very low (ppb range) and the same order of magnitude (Table 6). Hence, the exposure concentrations for all piscivores were based on the 95% UCL and maximum concentration of COPECs found in all of the whole fish samples. In contrast, concentrations of most COPECs tended to be higher in fish from Oxley Pond compared to fish from Pond J and Pond K. Rather than conduct three risk assessments for each of the ponds, the worst-case concentrations from Oxley's Pond were assumed to apply to all of the on-Site ponds.

These same fish concentrations were used to estimate COPEC concentrations in benthic invertebrates. This is a moderately conservative assumption as several of the OC pesticides included as COPECs are generally considered to biomagnify in the food chain (e.g., dieldrin, DDTs, hexachlorobenzene). Thus, fish should typically have higher concentrations than prey they consume such as benthic invertebrates. In addition, fish typically have higher lipid concentrations than benthic invertebrates, so the latter would generally have lower concentrations of bioaccumulative COPECs based on lipid-normalization.

6.4.4 HAZARD ASSESSMENT AND RISK CHARACTERIZATION

The results of the preliminary quantitative assessment for terrestrial indicator species is summarized in Table E5. The results for the semi-aquatic indicator species is summarized in Tables E6, E7, and E8 of Appendix E. The results are presented as Hazard Quotients (HQs), which are unitless values derived by dividing the estimated

dose by the effects level (i.e., NOAEL or LOAEL). A HQ less than one indicates the potential for risk is within acceptable limits, whereas a HQ greater than one indicates a potential for risk. At this stage of evaluation, a HQ greater than one is not necessarily indicative of actual risk.

Terrestrial Receptors

For the terrestrial indicator species (both mammalian and avian species), all NOAEL HQs values for estimated exposure to dieldrin were all below one except for the masked shrew. An HQ below one is indicative of an acceptable potential for risk. Although the masked shrew had an HQ above unity, the HQ value is based on inclusion of 2004 and 2009 soil concentration data. However, NOAEL SQ values for the masked shrew are less than unity when only the more recent 2009 data are used. The 2009 data is also considered to be more representative of dieldrin concentrations in soil compared to the 2004 data given that the half-life of dieldrin is approximately 5 years. Further, even with the inclusion of the 2004 data (worst-case exposure), the LOAEL SQ value for the masked shrew is 0.33, a value indicative of an acceptable potential for risk. Hence, risks to shrews, as will all other terrestrial receptors, from exposure to dieldrin in on-Site soil is considered to be low.

Semi-Aquatic Receptors

Similar to the terrestrial indicator species, NOAEL HQs values for estimated exposure to OC pesticides for all semi-aquatic indicator species were all below one, a value indicative of an acceptable potential for risk. Further, even with the conservatism built into the simple food chain models, estimated exposures did not exceed 20% of the NOAEL dose. This result was expected given the very low concentrations of COPECs found in fish and sediments of the on-Site ponds. Risks to semi-aquatic mammalian and avian indicator species from exposure to OC pesticides in on-Site sediment and fish tissue is considered to be low.

6.5 UNCERTAINTIES

There is often some uncertainty in ecological risk assessments. To avoid incorrectly dismissing actual risks to ecological receptors, risk assessment tent to employ conservative assumptions that tend to overestimate risk. For example, in the assessments above, organisms were assumed to eat 100% contaminated food, all of which came from contaminated locations. In fact, most of the birds migrate for some portion of the year, and many of the non-migratory species will range across the contaminated and uncontaminated areas of the Site.

Concentrations of dieldrin in terrestrial prey (worms, plants, and small vertebrates) were estimated using book values for media-to-receptor uptake factors or models. While these could have underestimated dieldrin concentrations in food items, no receptors except the shrew exceeded the NOAEL dose. Moreover, potential risks from dieldrin in soils should be declining over time, with a half life of 5 to 10 years, so these already negligible risks to a small part of the ecosystem will further decrease over time.

The triad evaluation provided evidence that sediment in the selected on-Site ponds is generally not toxic to the organisms tested. However, one sediment sample collected from Pond J had decreased survival and growth of the test organism compared to the other samples. The mechanisms inducing toxicity were not identified as this sediment sample did not contain detectable pesticide concentrations. In addition, results of the benthic community analysis identified significantly decreased benthic density and diversity values for the samples collected from Oxley's Pond. The lack of benthic organisms in this pond is not known as the sediments from this pond were identified to be non-toxic to both benthic organisms and juvenile fish.

7.0 HUMAN HEALTH RISK ASSESSMENT

The HHRA serves to evaluate potential human exposure to pesticide COPCs in the areas proposed for redevelopment at the Site in order to determine whether an unacceptable risk to human health exists. As indicated above, the Site is being redeveloped for residential/recreational use as part of the Salmonier Cottage Initiative. As such, the HHRA was conducted assuming residential and recreational land use.

The scope of this HHRA is to:

1) Compare maximum concentrations of all analyzed chemicals in soil, groundwater, sediment, surface water, and fish tissue with the appropriate pathway specific human health-based screening criteria established by the applicable provincial or regional jurisdiction (Atlantic Partners in RBCA Implementation (PIRI) for petroleum hydrocarbons) and the CCME guidance to identify the COPCs. Where no Atlantic PIRI or CCME Screening Criteria are available, data will be screened against appropriate criteria published by other Canadian agencies such as the Ontario Ministry of Environment (MOE), followed by guidance from the United States Environmental Protection Agency (USEPA).
2) Compare maximum concentrations of all analyzed chemicals in soil, groundwater, sediment, surface water, and fish tissue with the appropriate local or regional background concentrations, where available.
3) Evaluate carcinogenic risks and non-carcinogenic hazards associated with exposure to pesticide constituents present at concentrations exceeding the appropriate screening criteria and background concentrations or to constituents for which no human health-based guidelines or background concentrations exist. Note that PHC constituents have not been carried forward to this quantitative risk assessment stage, as they are not considered to be COPCs present in the areas proposed for redevelopment. Additional assessment will be required in the former SCF infrastructure area prior to considering it for redevelopment.
4) Develop Site-Specific Target Levels (SSTLs) for all pesticide COPCs and exposure pathways with carcinogenic risks and non-carcinogenic hazards exceeding the Health Canada target risk and hazard levels of 1.0E-05 and 0.2, respectively.

This quantitative HHRA is conducted for the potential pesticide COPCs that may be present in soil, future on-site garden produce, sediment, groundwater, surface water, and fish tissue in accordance with Health Canada's document *Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment, Draft* V*ersion 2.0* (Health Canada, 2009a), *Part II: Health Canada Toxicological*

Reference Values (TRVs) and Chemical-Specific Factors (Health Canada, 2009b) *and Part V: Guidance on Complex Human Health, Detailed Quantitative Risk Assessment for Chemicals, Draft Version 1, February 2009 (HC, 2009c),* by the Contaminated Sites Division (CSD), Safe Environments Programme, Health Canada, Ottawa. Supplemental methodology and information was obtained from CCME's *Canadian Environmental Quality Guidelines* (CCME, 2011a), Atlantic Risk Based Corrective Action (RBCA) Version 2.0 for Petroleum Impacted Sites in Atlantic Canada (ARBCA, 2007) and the Ontario MOE's, *Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009* (MOE, 2009).

The HHRA is comprised of a problem formulation step, an exposure assessment step, a toxicity assessment step, a risk characterization step, an uncertainty analysis, and the development of SSTLs. These RA steps are presented in the following sections.

7.1 PROBLEM FORMULATION

The problem formulation step of the HHRA involves developing the human health conceptual site model (CSM) to identify the receptors that may be exposed to the COPCs present in soil, on-site garden produce, groundwater, sediment, surface water, and fish tissue at the Site.

Since the future property use is intended to be for residential and recreational purposes, the potential receptors for the Site include an infant, toddler, child, teen, and adult resident; an infant, toddler, child, teen and adult recreational user (in undeveloped areas); and an adult construction/utility worker performing ground intrusive activities.

The following sections describe the problem formulation step of the RA.

7.1.1 CHEMICALS OF POTENTIAL CONCERN IDENTIFICATION

Tables F.1, F.2, F.3, F.4, and F.5 of Appendix F present the minimum and maximum chemical concentrations, range of detection limits, detection frequency, location of the maximum concentration for the detected chemicals, and applicable screening criteria for all analyzed chemicals in soil, groundwater, sediment, surface water, and fish tissue, respectively.

- Soil, groundwater, sediment, and surface water screening criteria for human health COPCs were chosen from one of the following:

- Petroleum Hydrocarbons: Atlantic Risk Based Corrective Action (RBCA) User Guidance for Petroleum Impacted Sites in Atlantic Canada, Version 2.0, Tier I Risk Based Screening Levels (RBSLs) and Tier II Pathway Specific Screening Levels (PSSLs) for Soil and Groundwater, Residential Land Use, Potable Groundwater Use, Coarse-grained Soil (Atlantic RBCA, 2007).
- Non-petroleum hydrocarbon chemicals: CCME: "*Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health, Residential/Parkland Land Use, Potable Groundwater Use, Coarse-grained Soil" (1999, Updated to February 2011*) (CCME, 2011a); or "*Guidelines for Canadian Drinking Water Quality Summary Table, Health Canada, Interim Maximum Acceptable Concentration (IMAC)", December 2010* (CCME, 2010*).*

- For parameters that do not have an applicable Atlantic RBCA or CCME screening criterion, a suitable screening value was selected from one of the following sources:
  - Ontario MOE's, *Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario*, December 22, 2009 (MOE, 2009). The MOE screening standards are based on a carcinogenic risk of 1.0 x 10^{-6}; therefore, to be consistent with the target risk level of 1.0 x 10^{-5}, the MOE standards were multiplied by a factor of 10.
    - Appendix A2, Soil Components for Table 3 Full Depth, Potable Water Scenario, Coarse Textured Soils, Residential/Parkland Land Use (soil and sediment screening).
    - Appendix A3, Groundwater Components for Potable Water Scenario, Coarse Textured Soil, Residential Land Use, lower of GW1, GW1 Odour, Residential GW2, and Residential GW2 Odour, where available (groundwater and surface water screening).
  - USEPA Regional Screening Levels (RSLs) Table (November 2010): RSLs for Resident Soil were applied for soil and sediment, and RSLs for Tap water were applied for groundwater and surface water. The RSLs are based on a carcinogenic risk of 1.0 x 10^{-6} and hazard index of 1.0; therefore, to be consistent with the target risk level of 1.0 x 10^{-5} and target hazard index of 0.2, the RSLs for carcinogens were multiplied by a factor of 10 and the RSLs for non-carcinogens were divided by a factor of 5. USEPA criteria were only used where CCME and MOE or other Provincial governments provided no guidance.

7.1.1.1 CHEMICALS OF POTENTIAL CONCERN IN SOIL SCREENING RESULTS

The screening values applied for soil were also applied for sediment to account for human contact with sediment. Likewise, the screening values applied for groundwater were also applied for surface water to conservatively account for possible inadvertent ingestion of surface water during swimming. Applicable screening criteria for fish tissue were not available; therefore, all chemicals detected in fish tissue were conservatively identified as COPCs.

For chemicals that were detected, the greater of the maximum detected concentration or maximum detection limit ("screening concentration") was selected to compare to the screening criteria.

It is standard practice in risk assessment to screen chemical concentrations in soil against established background soil concentrations (where available), in addition to screening against generic regulatory criteria. Many contaminants, in particular metals, are naturally occurring, and natural levels can exceed CCME guidelines and other generic guidelines without representing anthropogenic contamination. If it is found that COPCs at the site are representative of natural (or representative urban) background levels, the site may not be considered contaminated despite the fact that generic guidelines are exceeded. In the case of this assessment, background soil concentrations have not been used in screening, as there are no known studies that have established accepted background soil concentrations for the area.

In human health screening tables F.1 to F.5, a compound was identified as a COPC if the screening concentration was above its respective screening criterion. All compounds that were detected but that do not have a screening criterion, were carried forward as COPCs in the quantitative risk assessment. All compounds that do not have a screening criterion, were not detected and were not identified as having been historically used at the Site were eliminated as COPCs. For example, there were a few pesticides (demeton, disulfoton, mirex, a-BHC) that were not detected in groundwater and surface water, however, had elevated detection limits above the screening criteria. These chemicals were also not detected in soil, are not considered to be Site-related and were only analyzed as they are included in the suite of pesticide analyses. Therefore, demeton, disulfoton, mirex, and a-BHC have not been identified as COPCs for Site groundwater and surface water and are not evaluated further in the HHRA. There were two pesticides (dichlofluanid and profenophos) that were detected at low frequency in sediment but do not have applicable screening criteria. These chemicals were also not detected in soil, are not considered to be Site-related and were only analyzed as they are

included in the suite of pesticide analyses. Furthermore, there is no toxicity information that would be required to evaluate these chemicals further in the HHRA. Therefore, dichlofluanid and profenophos have not been identified as COPCs in Site sediment and are not evaluated further in the HHRA.

As presented in Table F.1 of Appendix F, petroleum hydrocarbons (including benzene, ethylbenzene, toluene, modified TPH (fuel oil source)), and dieldrin were identified as COPCs in soil, as the maximum detected concentrations exceeded the screening criteria. As this HHRA is focused on areas proposed for redevelopment, and the PHCs are limited to the former SCF infrastructure area, which is not proposed for reevelopment, PHCs were not carried forward into the quantitative HHRA stage. Therefore, dieldrin was the only COPC carried forward to the quantitative HHRA stage.

7.1.1.1.1 PATHWAY-SPECIFIC SCREENING OF PETROLEUM HYDROCARBON IN SOIL RESULTS

The maximum concentrations of PHC COPCs present in the former SCF area were further evaluated against Atlantic RBCA Tier II pathway-specific screening levels (PSSLs) in the following table, in order to demonstrate the exposure pathway(s) that may be of concern in the areas of exceedances.

ATLANTIC RBCA TIER II PSSLs – PETROLEUM HYDROCARBONS

COPC	*Residential Land Use Potable Groundwater, Indoor Air Pathway*	*Residential Land Use Potable Groundwater, Soil Ingestion Pathway*	*Residential Land Use Potable Groundwater, Soil Leaching to Potable Groundwater Pathway*	*Maximum Site Concentrations*
Benzene				
Soil (mg/kg)	0.16	390	0.031	**0.082**
Toluene				
Soil (mg/kg)	14	12,000	0.38	**0.657**
Ethylbenzene				
Soil (mg/kg)	58	7,000	0.083	**0.975**
TPH – fuel oil				
Soil (mg/kg)	140	5,300	1,100	**4400**

Data presented in the above table indicate that PHC exceedances on-Site would only be of concern if there were buildings or potable wells located near the area of the soil

exceedances. Due to their location , these PHC impacts are not considered to be of concern to the currently proposed redevelopment areas. Since buildings or wells are no longer present in the former SCF infrastructure area (refer to Figure 4A and 4C), the only remaining applicable exposure pathway would be soil ingestion. All petroleum hydrocarbon concentrations on-Site are within the Tier II PSSLs for soil ingestion, indicating that there would be no unacceptable risk from PHCs in soil to residential or recreational receptors visiting these undeveloped areas.

In addition to petroleum hydrocarbon COPC in the former SCF infrastructure area, it is possible that there may be other potential metals COPCs present in soil in this area, due to the possible past use of lead based paint on the former buildings. If future development plans are slated for this area, additional assessment would be required to further assess the potential risk to receptors from petroleum hydrocarbon and potential metals impacts.

7.1.1.2 CHEMICALS OF POTENTIAL CONCERN IN GROUNDWATER SCREENING RESULTS

As presented in Table F.2 of Appendix F, none of the parameters analyzed in groundwater exceeded the applicable screening criteria and therefore none were selected as COPCs; therefore, groundwater will not be carried forward as a medium of concern in the HHRA.

7.1.1.3 CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT SCREENING RESULTS

As presented in Table F.3 of Appendix F, none of the parameters analyzed in sediment exceeded the applicable screening criteria and therefore none were selected as COPCs; therefore, sediment will not be carried forward as a medium of concern in the HHRA.

7.1.1.4 CHEMICALS OF POTENTIAL CONCERN IN SURFACE WATER SCREENING RESULTS

As presented in Table F.4 of Appendix F, none of the parameters analyzed in surface water exceeded the applicable screening criteria and therefore none were selected as COPCs, therefore surface water will not be carried forward as a medium of concern in the HHRA.

7.1.1.5 CHEMICALS OF POTENTIAL CONCERN IN SURFACE WATER SCREENING RESULTS

As presented in Table F.5 of Appendix F, 2,4'-DDE, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-chlordane, dieldrin, endrin, hexachlorobenzene, methoxychlor, mirex, and trans-nonachlor were selected as the COPCs in fish tissue to be carried forward in the HHRA, as the analytes were detected.

7.1.2 EXPOSURE PATHWAY IDENTIFICATION

The following table presents a summary of all operable and inoperable human health exposure pathways.

EXPOSURE PATHWAYS – HUMAN HEALTH SCREENING		
POTENTIAL PATHWAY	***OPERABLE/ NON-OPERABLE***	***RATIONALE***
Direct Ingestion of Soil	Operable	Direct contact possible for all receptors
Direct Soil Dermal Contact	Operable	Direct contact possible for all receptors
Direct Soil Particulate Inhalation	Operable	Inhalation of dust is possible for all receptors
Inhalation of Outdoor Air (Volatiles in Soil)	Operable but Insignificant	Inhalation of volatile chemicals in outdoor air is possible for resident receptors under future land use (cottages), but the contribution from this pathway is insignificant due to the high dilution of chemicals in outdoor air.
Inhalation of Indoor Air (from Volatiles in Soil)	Operable	Inhalation of volatile chemicals in indoor air possible for resident receptors under future land use (cottages).
Direct Ingestion Groundwater	Non-Operable	There are no identified COPCs in Site groundwater; therefore, there is no potential for ingestion of groundwater to result in unacceptable risks or hazards by any receptor.
Direct Dermal Contact with Groundwater	Non-Operable	There are no identified COPCs in Site groundwater; therefore, there is no potential for direct dermal contact with Site groundwater to result in unacceptable risks or hazards by any receptor.
Inhalation of Outdoor Air (Volatiles in Groundwater)	Non-Operable	There are no identified COPCs in Site groundwater; therefore, there is no potential for inhalation of volatiles from Site groundwater to result in unacceptable risks or hazards by any receptor.

EXPOSURE PATHWAYS – HUMAN HEALTH SCREENING (Cont'd)		
POTENTIAL PATHWAY	***OPERABLE/ NON-OPERABLE***	***RATIONALE***
Inhalation of Indoor Air (from Volatiles in Groundwater)	Non-Operable	There are no identified COPCs in Site groundwater; therefore, there is no potential for inhalation of volatiles from Site groundwater to result in unacceptable risks or hazards by any receptor.
Direct Ingestion of Sediment	Non-Operable	There are no identified COPCs in Site sediment; therefore, there is no potential for ingestion of sediment to result in unacceptable risks or hazards by any receptor.
Direct Dermal Contact with Sediment	Non-Operable	There are no identified COPCs in Site sediment; therefore, there is no potential for direct dermal contact with Site sediment to result in unacceptable risks or hazards by any receptor.
Direct Ingestion of Surface Water	Non-Operable	There are no identified COPCs in Site surface water; therefore, there is no potential for ingestion of surface water to result in unacceptable risks or hazards by any receptor.
Direct Dermal Contact with Surface Water	Non-Operable	There are no identified COPCs in Site surface water; therefore, there is no potential for direct dermal contact with Site surface water to result in unacceptable risks or hazards by any receptor.
Direct Ingestion of Fish Tissue	Operable	Direct contact possible for residents and recreational receptors.
Direct Ingestion of future home garden produce	Operable	Ingestion of garden produce grown in Site soils is possible for all resident receptors.

Based on the above table, the exposure pathways within the Site that are evaluated in the HHRA are limited to exposure to soil through incidental ingestion, dermal contact, and inhalation of vapours and particulate (dust), ingestion of garden produce and ingestion of fish.

7.1.3 CONCEPTUAL SITE MODEL

The combination of factors (chemical source, media of concern, release mechanisms, and potential receptors) that could produce a complete exposure pathway and lead to human uptake of chemicals at the Site are assessed in what is defined as a conceptual site model (CSM).

As presented in Section 7.1.1, impacted media at the Site is limited to soil and fish tissue. It is also considered possible that future cottage residents may choose to grow and consume produce grown in on-Site soil on their properties, and that these plants may uptake COPCs from on-Site soils. Therefore, ingestion, dermal contact, and inhalation of soil particulates, ingestion of garden produce grown in Site soil and ingestion of fish tissue are the potential routes of exposure to Site COPCs. Much of the Site will be

redeveloped for the construction of cottages. Therefore, the foreseeable future land use for the Site is residential in areas proposed for development and recreational in undeveloped areas. Thus, the identified receptors include a resident, a recreational user (for undeveloped areas) and a construction/utility worker conducting subsurface excavations at the Site.

The CSM for the resident receptor is illustrated on Figure 10A. The resident is assumed to include an infant, toddler, child, teen, or adult living at the Site, who may be exposed to soil by direct contact (incidental ingestion, dermal contact, and particulate inhalation); inhalation of outdoor air through migration of volatile COPCs from soil to outdoor; and via inhalation of indoor air through the migration of volatile COPCs from soil to indoor air. The resident could also be exposed to COPCs in site-grown garden produce via ingestion of garden produce and to COPCs in fish tissue through ingestion of fish.

The CSM for the recreational user is illustrated on Figure 10B. The recreational user is assumed to include an infant, toddler, child, teen, or adult occasionally visiting the undeveloped portions of the Site, who may be exposed to soil by direct contact (incidental ingestion, dermal contact, and particulate inhalation) and inhalation of outdoor air through migration of volatile COPCs from soil to outdoor.

The CSM for the construction/ utility worker is illustrated on Figure 10C. The construction/utility worker is assumed to be an adult worker involved in conducting subsurface activities that would occur during the redevelopment of the Site. The construction/utility worker could be exposed to soil by direct contact (incidental ingestion, dermal contact, and vapour/particulate inhalation) and inhalation of outdoor air through migration of volatile COPCs from soil to outdoor.

All of these factors are evaluated in the CSM and the HHRA. Potentially sensitive receptors (such as First Nations Communities) do not live in the area of the Site and are not expected to utilize the Site on a regular basis.

7.2 EXPOSURE ASSESSMENT

7.2.1 COPC EXPOSURE ESTIMATION

Analytical data collected during the subsurface investigations were used to estimate the chemical intake of the COPCs in the various media by the various exposure pathways presented above. The chemical concentration or exposure point concentration (EPC) of each COPC in the various media corresponds to the 95 percent Upper Confidence

Limit (UCL) of the mean of the dataset, also known as the reasonable maximum exposure (RME). The RME values for the various exposure media were determined based on the observed data distribution and the percentage of censored data points (non-detect results). Appendix G contains a detailed description of the statistical methods used to determine the RME (95 percent UCL) values.

The arithmetic mean, maximum, and RME (95 percent UCL) concentrations for the pesticide COPC identified in soil (dieldrin) is presented in Table F.6 of Appendix F. As the Site will be separated into various lots, there is the potential that the receptors in one particular lot (i.e. owners of the cottage) could be exposed to the soil within that lot at a higher frequency than at other locations within the cottage development. Therefore, as indicated in the table below, the soil EPC applied for dieldrin in soil in the HHRA was set to the maximum detected concentration.

SOIL COPC EXPOSURE POINT CONCENTRATIONS		
MEDIUM	**COPC**	**EXPOSURE POINT (MAXIMUM) CONCENTRATION (µg/g)**
Soil	Dieldrin	4.5

The arithmetic mean, maximum, and RME (95 percent UCL) concentrations for the COPCs identified in fish tissue are presented in Table F.7 of Appendix F, and summarized in the table below. The EPCs applied in the HHRA for fish tissue were set to the RME concentrations.

FISH TISSUE COPC EXPOSURE POINT CONCENTRATIONS		
MEDIUM	**COPC**	**EXPOSURE POINT CONCENTRATION (µg/kg)**
Fish Tissue	2,4'-DDE	0.1
	4,4'-DDD	0.33
	4,4'-DDE	2.96
	4,4'-DDT	0.479
	alpha-Chlordane	0.45
	Dieldrin	0.974
	Endrin	0.23
	Hexachlorobenzene	0.181
	Methoxychlor	0.479
	Mirex	0.13
	Trans-nonachlor	0.572

7.2.2 DESCRIPTION OF ENVIRONMENTAL FATE MODELS

For exposure to all soil COPCs (dieldrin) carried forward to quatitative HHRA, the environmental fate model methods outlined in the Health Canada document, "*Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment, Draft* Version *2.0"* (HC, 2009a) were used to evaluate risk to potential receptors.

7.2.3 EXPOSURE EQUATIONS

In the HHRA, the magnitude of exposure reflects the chemical concentration, contact rate, exposure time, and body weight. This section outlines the approach for determining the amount of the identified COPCs to which the selected receptors may be exposed, via the respective exposure pathway. Sample calculations for each exposure estimate or intake have been presented in Appendix H and summarized below.

Incidental Ingestion of Soil Exposure Pathway

The intake equation for calculating chemical intake from the incidental ingestion of soil is:

$$\mathbf{CDI} = \frac{\mathbf{C} \times \mathbf{IR} \times \mathbf{RAF_o} \times \mathbf{CF} \times \mathbf{EF} \times \mathbf{ED}}{\mathbf{BW} \times \mathbf{AT}}$$

Where:

CDI	=	chronic daily intake via soil ingestion (mg/kg-day)
C	=	chemical concentration in soil (mg/kg)
IR	=	ingestion rate of soil (mg/day)
RAF_o	=	relative absorption factor – oral (unitless)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
CF	=	conversion factor (e.g., kg/10^6 mg)
BW	=	body weight (kg)
AT	=	averaging time (averaging period, days)

Soil Dermal Contact Exposure Pathway

The intake equation for calculating chemical intake from dermal exposure to soil is:

$$\mathbf{CDI} = \frac{\mathbf{C} \times \mathbf{CF} \times \mathbf{SA} \times \mathbf{AF} \times \mathbf{RAF_d} \times \mathbf{EF} \times \mathbf{ED}}{\mathbf{BW} \times \mathbf{AT}}$$

Where:

CDI = chronic daily intake via dermal contact (mg/kg-day)
C = chemical concentration in soil (mg/kg)
SA = skin surface area available for contact (cm^2)
AF = soil to skin adherence factor (mg/cm^2)
RAF_d = relative absorption factor – dermal (unitless)
EF = exposure frequency (days/year)
ED = exposure duration (years)
CF = conversion factor (e.g., $kg/10^6$ mg)
BW = body weight (kg)
AT = averaging time (averaging period, days)

Soil Vapour/Particulate Inhalation from Soil Exposure Pathway

The intake equation for calculating chemical intake from the inhalation of particulates originating from soil is, after USEPA (2002):

$$\mathbf{CDI} = \frac{\mathbf{C \times FT \times EF \times ED \times PEF/VF}}{\mathbf{AT}}$$

Where:

CDI = chronic daily intake via soil particulate inhalation (mg/m^3)
C = chemical concentration in soil (mg/kg)
FT = fraction of time exposed (hours per 24 hours) (unitless)
EF = exposure frequency (days/year)
ED = exposure duration (years)
PEF = particulate emission factor (m^3/kg)
VF = volatilization factor (m^3/kg)
AT = averaging time (averaging period, days)

Inhalation of Indoor Air Exposure Pathway

The intake equation for calculating chemical intake from the inhalation of indoor air is:

$$\mathbf{CDI} = \frac{\mathbf{C_{IA} \times ET \times EF \times ED}}{\mathbf{AT}}$$

Where:

CDI = chronic daily intake via inhalation milligrams per cubic metre (mg/m^3)

C_{IA} = chemical concentrations in indoor air (mg/m^3)
ET = exposure time (hours per 24 hours exposed) (unitless)
EF = exposure frequency (days/year)
ED = exposure duration (years)
AT = averaging time (period over which exposure is averaged) (days)

Ingestion of Backyard Garden Produce Exposure Pathway

The intake equation for calculating chemical intake from the ingestion of backyard garden produce is:

$$\mathbf{CDI} = \frac{\mathbf{C \times IR \times RAF_o \times EF \times ED}}{\mathbf{BW \times AT}}$$

Where:

CDI = chronic daily intake via garden produce ingestion (mg/kg-day)
C = chemical concentration in garden produce (mg/kg)
IR = ingestion rate of produce (kg produce/day)
RAF_o = relative absorption factor - oral (unitless)
EF = exposure frequency (days/year)
ED = exposure duration (years)
BW = body weight (kg)
AT = averaging time (averaging period, days)

Since chemical concentrations in garden vegetables have not been directly measured at the site, these concentrations are estimated based on a published bioconcentration factor (BCF) which estimates the rate that the plant will uptake the COPC from the soil, and a typical percentage of garden produce that is assumed to be consumed from the site, in relation to the total produce intake, as follows:

$$\mathbf{C = Csoil \times BCF \times F1}$$

Where:

C = chemical concentration in garden produce (mg/kg)
Csoil = chemical concentration in soil (mg/kg)
BCF = Bio concentration Factor for uptake of chemical from soil to garden produce (unitless)
F1 = Fraction Homegrown Garden Produce Ingested (unitless)

Ingestion of Fish Tissue Exposure Pathway

The intake equation for calculating chemical intake from the ingestion of fish tissue is:

$$CDI = \frac{C \times IR \times RAF_o \times EF \times ED}{BW \times AT}$$

Where:

CDI	=	chronic daily intake via fish tissue ingestion (mg/kg-day)
C	=	chemical concentration in fish tissue (mg/kg)
IR	=	ingestion rate of fish tissue (kg fish/day)
RAF_o	=	relative absorption factor (unitless)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (averaging period, days)

For carcinogens, a lifetime average daily dose of the chemical is estimated which pro-rates the total cumulative intake over a lifetime. An averaging time (AT) of 80 years for residents and 60 years for construction/utility workers was used for carcinogens.

For non-carcinogens, the chemical intake is estimated over the appropriate exposure period or averaging time. The averaging time selected depends on the exposure duration of the specific population being evaluated.

7.2.4 RECEPTOR CHARACTERISTICS

Receptor characteristics are primarily drawn from Table 5 in Health Canada, Part I (Health Canada, 2009a). Since the future property use is intended to be for residential and recreational purposes, the potential receptors for the Site include an infant, toddler, child, teen, and adult resident; an infant, toddler, child, teen and adult recreational user; and an adult construction/utility worker performing ground intrusive activities. Of the above receptors, the toddler is considered to be the most sensitive receptor with respect to non-carcinogenic hazard, due to their elevated rate of soil ingestion relative to their body weight. Therefore, the non-carcinogenic hazard calculations for the residents and recreational users were based on the toddler receptor. The carcinogenic risk for the resident and recreational user was estimated using all life stages, including infant, toddler, child, teen, and adult (80 years). The carcinogenic risk for the construction/utility worker was estimated using the duration of adulthood only (60 years).

Resident

The resident (infant, toddler, child, teen, and adult) exposure assumptions utilized in the estimation of the magnitude of their exposure to soil, indoor air, on-site garden produce and fish tissue are summarized below.

HUMAN RECEPTORS CHARACTERISTICS – RESIDENT

Receptor Characteristics	*Visitor*					*Reference*
	Infant	*Toddler*	*Child*	*Teen*	*Adult*	
Fraction of Time Exposed – Soil (Time Spent Outdoors)	24 hr/24 hr	24 hr/24 hr	24 hr/24 hr	24 hr/24 hr	24 hr/24 hr	Professional Judgment (1)
Exposure Time – Indoor Air	24 hr/24 hr	24 hr/24 hr	24 hr/24 hr	24 hr/24 hr	24 hr/24 hr	Professional Judgment (1)
Exposure Frequency – Soil	255 days/year	255 days/year	255 days/year	255 days/year	255 days/year	Professional Judgment (2)
Exposure Frequency – Garden Vegetables	365 days/year	365 days/year	365 days/year	365 days/year	365 days/year	Health Canada, 2009a
Exposure Frequency –Fish Tissue	365 days/year	365 days/year	365 days/year	365 days/year	365 days/year	Health Canada, 2009a
Exposure Duration	0.5 years	4.5 years	7 years	8 years	60 years	Health Canada, 2009a
Body Weight	8.2 kg	16.5 kg	32.9 kg	59.7 kg	70.7 kg	Health Canada, 2009a
Ingestion Rate of Soil	20 mg/day	80 mg/day	20 mg/day	20 mg/day	20 mg/day	Health Canada, 2009a
Ingestion Rate of Root Vegetables	0.083 Kg/day	0.105 Kg/day	0.161 Kg/day	0.227 Kg/day	0.188 Kg/day	Health Canada, 2009a
Ingestion Rate of Other Vegetables	0.072 Kg/day	0.067 Kg/day	0.098 Kg/day	0.120 Kg/day	0.137 Kg/day	Health Canada, 2009a
Ingestion Rate of Fish Tissue	0 kg-fish /day	0.0088 kg-fish /day	0.0142 kg-fish /day	0.0164 kg-fish /day	0.0175 kg-fish /day	Health Canada, 2009a (3)
Skin Surface Area Available for Contact	1,050 cm^2	1,720 cm^2	2,865 cm^2	4,400 cm^2	5,000 cm^2	Health Canada, 2009 a
Soil to Skin Adherence Factor	0.1 mg/cm^2	0.1 mg/cm^2	0.1 mg/cm^2	0.1 mg/cm^2	0.1 mg/cm^2	Health Canada, 2009a
Ingestion Absorption Factor	1	1	1	1	1	Health Canada, 2009 a
Dermal Absorption Factor	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific	Refer to Section 7.2.5
Volatilization Factor (VF)	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific	Refer to Table F.10 of Appendix F

HUMAN RECEPTORS CHARACTERISTICS – RESIDENT (Cont'd)						
Receptor Characteristics	*Visitor*					*Reference*
	Infant	*Toddler*	*Child*	*Teen*	*Adult*	
Averaging Time (Cancer)	29,200 days	29,200 days	29,200 days	29,200 days	29,200 days	Health Canada, 2009a
Averaging Time (Non-Cancer)	1,643 days	1,643 days	1,643 days	1,643 days	1,643 days	Health Canada, 2009a

Notes:

(1) Professional Judgment: although normally a fraction of a 24 hour day would be apportioned to time spent inside and outside a building on-site, for conservatism, 24 hours per day has been assumed for both indoor and outdoor scenarios. This would be protective of the receptor for the inhalation pathway, regardless of how much time is spent indoors or outdoors each day.

(2) Professional Judgment; for exposed coastal sites snow cover persists for 110 days (Canadian Technical Report, 2003). This is consistent with Environment Canada (www.climate.weatheroffice.ec.gc.ca) weather data provided for Newfoundland stations. Therefore exposure to soil occurs for the remainder of the year (365 – 110 = 255 days).

(3) Health Canada fish ingestion rates are based on subsistence fishers; however, the residents at the Site are considered recreational fishers. Therefore, the Health Canada fish ingestion rates were adjusted to be consistent with USEPA (2000) adult recreational fisher consumption rates: toddler = (0.056/0.111)*0.0175; child = (0.09/0.111)*0.0175; teen = (0.104/0.111)*0.0175.

All exposure assumptions and equations utilized in the calculation of the magnitude of exposure to COPCs in soil, indoor air, garden vegetables and fish tissue for a resident are also summarized in the following tables:

- Table F.8 of Appendix F: soil exposure for resident
- Table F.13 of Appendix F: indoor air exposure for resident
- Table F.14 of Appendix F: garden vegetable exposure for resident
- Table F.15 of Appendix F: fish tissue exposure for resident

Inhalation of vapours within ambient (outdoor) air originating from soil is modeled through the use of a Volatilization Factor (VF) to estimate ambient air concentrations based on the soil concentration. The VF is chemical specific and was calculated using the approach presented in USEPA (2002). Site-specific soil and chemical-specific properties were used in calculating the VF. The equations and inputs for the calculated VF values are presented in Table F.10 of Appendix F.

The concentration of dieldrin within indoor air (from soil) was modeled using the Johnson and Ettinger (1991) model (J&E Model), as described in Appendix I. For the purposes of calculating indoor air exposure, a default residential building size of 10 m by 15 m (Atlantic RBCA, 2007) by 2.44 m (Health Canada, 2008), with slab-on-grade construction was applied.

Recreational User

The recreational user receptor is intended to evaluate the risk associated with residents and visitors accessing undeveloped portions of the site (which may contain elevated dieldrin concentrations in soil) on an occasional basis. These areas may include those not intended to be developed due to the presence of soil exceeding SSTLs developed for residential use. Many of the recreational user's exposure assumptions are the same as the resident, however, due to the undeveloped nature of these areas, the potential exposure pathways would not include inhalation of indoor air, ingestion of backyard garden produce or ingestion of fish as these exposures are conservatively evaluated under the residential receptor exposure. The recreational receptor (infant, toddler, child, teen, and adult) exposure assumptions utilized in the estimation of the magnitude of their exposure to soil in undeveloped areas of the site are summarized below.

HUMAN RECEPTORS CHARACTERISTICS – RECREATIONAL USER

Receptor Characteristics	*Visitor*					*Reference*
	Infant	*Toddler*	*Child*	*Teen*	*Adult*	
Fraction of Time Exposed – Soil (inhalation of outdoor air)	24 hr/24 hr	24 hr/24 hr	24 hr/24 hr	24 hr/24 hr	24 hr/24 hr	Professional Judgment (3)
Exposure Frequency – Soil	70 days/year	70 days/year	70 days/year	70 days/year	70 days/year	Health Canada, 2009a (1)
Exposure Duration	0.5 years	4.5 years	7 years	8 years	60 years	Health Canada, 2009a
Body Weight	8.2 kg	16.5 kg	32.9 kg	59.7 kg	70.7 kg	Health Canada, 2009a
Ingestion Rate of Soil	20 mg/day	80 mg/day	20 mg/day	20 mg/day	20 mg/day	Health Canada, 2009a
Skin Surface Area Available for Contact	1,050 cm^2	1,720 cm^2	2,865 cm^2	4,400 cm^2	5,000 cm^2	Health Canada, 2009 a
Soil to Skin Adherence Factor	0.1 mg/cm^2	0.1 mg/cm^2	0.1 mg/cm^2	0.1 mg/cm^2	0.1 mg/cm^2	Health Canada, 2009a
Ingestion Absorption Factor	1	1	1	1	1	Health Canada, 2009 a
Dermal Absorption Factor	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific	Refer to Section 7.2.5
Volatilization Factor (VF)	chemical-specific	chemical-specific	chemical-specific	chemical-specific	chemical-specific	Refer to Table F.10 of Appendix F
Averaging Time (Cancer)	29,200 days	29,200 days	29,200 days	29,200 days	29,200 days	Health Canada, 2009a
Averaging Time (Non-Cancer)	1,643 days	1,643 days	1,643 days	1,643 days	1,643 days	Health Canada, 2009a

Notes:

(1) Based on exposure duration and frequency of 2 days per week, 35 weeks per year for a recreational land use, included in Health Canada 2009a. This is also protective of a recreational user accessing the site every day, all summer long (7 days per week for 10 weeks).
(2) Skin surface area to include hands, lower arms (area for arms/2) and lower legs (area of legs/2).
(3) Professional Judgment: For conservatism, 24 hours per day has been assumed for time spent outdoors on-site by the recreational user in this HHRA. This would be protective of the receptor for the inhalation pathway, regardless of how much time is spent on-site each day.

All exposure assumptions and equations utilized in the calculation of the magnitude of exposure to COPCs in soil for a recreational user are also summarized in the following tables:

- Table F.9 of Appendix F: soil exposure for recreational user

Inhalation of vapours within ambient (outdoor) air originating from soil is modeled through the use of a Volatilization Factor (VF) to estimate ambient air concentrations based on the soil concentration. The VF is chemical specific and was calculated using the approach presented in USEPA (2002). Site-specific soil and chemical-specific properties were used in calculating the VF. The equations and inputs for the calculated VF values are presented in Table F.10 of Appendix F.

Construction/Utility Worker

The construction/utility worker exposure assumptions utilized in the estimation of the magnitude of their exposure to soil are summarized below.

HUMAN RECEPTORS CHARACTERISTICS – CONSTRUCTION/UTILITY WORKER

Receptor Characteristics	*Construction/Utility Worker*	*Reference*
Exposure Time – inhalation of outdoor air (ET)	24 hours/24 hour day	Professional Judgment (3)
Exposure Frequency – Soil (EF)	65 days/year	Health Canada, 2009a(1)
Exposure Duration – Soil (ED)	35 years	Health Canada, 2009a
Body Weight (BW)	70.7 kg	Health Canada, 2009a
Ingestion Rate of Soil (IR)	100 mg/day	Health Canada, 2009a
Skin Surface Area Available for Contact (SA)	5,000 cm^2	Health Canada, 2009a(2)
Soil to Skin Adherence Factor (AF)	1 mg/cm^2	Health Canada, 2009a
Ingestion Absorption Factor (ABS_o)	1	Health Canada, 2009a
Dermal Absorption Factor (ABS_d)	chemical-specific	Refer to Section 7.2.5
Volatilization Factor (VF)	chemical- specific	Refer to Table F.12 of Appendix F
Averaging Time - cancer (AT-C)	21,900 days	Health Canada, 2009a

HUMAN RECEPTORS CHARACTERISTICS – CONSTRUCTION/UTILITY WORKER		
Receptor Characteristics	*Construction/Utility Worker*	*Reference*
Averaging Time - non-cancer (AT-N)	12,775 days	Health Canada, 2009a

Notes:

(1) Based on exposure duration and frequency of 5 days per week, 13 weeks per year for a construction/utility worker, included in Health Canada 2009a.

(2) Skin surface area to include hands (890 cm^2), lower arms (2500/2 cm^2) and lower legs (5720/2 cm^2).

(3) Professional Judgment: although Health Canada, 2009a reference suggested 10 hours per day spent on-site for the Construction worker receptor, for conservatism, 24 hours per day outside has been assumed in this HHRA. This would be protective of the receptor spending an unlimited amount of time outdoors, on-site each day.

All exposure assumptions and equations utilized in the calculation of the magnitude of exposure to COCs in soil for the construction/utility worker are also summarized in the following table:

- Table F.11 of Appendix F: Soil Exposure for the Construction/Utility Worker

Inhalation of vapours within ambient air originating from soil is modelled through the use of a VF to estimate ambient air concentrations based on the soil concentration. The VF is chemical specific and was calculated using the approach presented by USEPA (2002), and the default soil properties presented in Health Canada (2009a). The equations and inputs for the calculated VF values are presented in Table F.12 of Appendix F.

7.2.5 BIOAVAILABILITY ASSESSMENT

Contaminants can be absorbed at different rates through different exposure routes (i.e. Oral, dermal, and inhalation). For some COPCs, separate toxicological reference values (TRVs) are available for oral and inhalation exposures. In these cases, the exposures via these pathways should be determined separately for comparison to pathway-specific TRVs. Absorption following soil ingestion (oral) exposure will be assumed to be 100%, as oral TRVs are based on delivered, not absorbed, dose. Likewise, absorption following inhalation exposure (from soil) will be assumed to be 100%, as inhalation TRVs are generally based on the measured air-borne concentration, not absorbed dose.

Few TRVs exist specifically for the dermal exposure pathway. Therefore, dermal exposure will routinely be added to the oral dose, following adjustment for relative bioavailability or absorption, for subsequent comparison to the oral TRV.

For COPCs where multiple exposure pathways will be summed for comparison to a single TRV, it will be necessary to apply relative absorption factors (RAFs) in exposure calculations. The relative oral, dermal, and inhalation absorption factors for dieldrin in soil is presented in the table below.

RELATIVE ABSORPTION FACTORS FOR SOIL			
COPC	RAF_{oral}	RAF_{dermal}	$RAF_{inhalation}$
Dieldrin	1	0.1	1

Source:
1. Health Canada 2009a. Federal Contaminated Site Risk Assessment in Canada, Part II: Toxicological Reference Values (TRVs) and Chemical-specific Factors, Health Canada, Version 2.0, May 2009.

7.3 TOXICITY ASSESSMENT

The purpose of the toxicity assessment is to evaluate available evidence regarding the potential for particular contaminants to cause adverse effects in potentially exposed individuals and to provide, where possible, an estimate of the relationship between the extent of exposure to a contaminant and the increased likelihood and/or severity of adverse effects.

The toxicity assessment is accomplished in two steps: hazard identification and dose-response assessment. The first step, hazard identification, is the process of determining whether exposure to an agent can cause an increase in the incidence of a particular adverse health effects (e.g., cancer and liver damage) and whether the adverse health effect is likely to occur in humans. Typically, this is established based on studies performed on laboratory animals.

The second step, dose-response evaluation, is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received, and the incidence of adverse health effects in the potentially exposed population. From this quantitative dose-response relationship, numerical values, known as toxicity values (i.e., reference doses and slope factors), are derived. These are used to estimate the incidence or potential for adverse effects as a function of human exposure to the agent. These toxicity values are used in the risk characterization step to estimate the potential for adverse effects occurring in humans at different exposure levels.

The relationship between the dose of a COPC and its toxic response must be determined to conduct a risk characterization. The dose-response relationships for various

constituents or constituent groups were derived from published toxicity data. A summary of the key health concern(s) associated with exposure to pesticide COPCs (2,4'-DDE, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-chlordane, dieldrin, endrin, hexachlorobenzene, methoxychlor, mirex, and trans-nonachlor) is provided in Appendix J, along with toxicological and chemical data.

TOXICOLOGICAL REFERENCE VALUE SOURCES	
COPC	***Oral/Dermal and Inhalation***
Pesticide COPCs	• Health Canada 2009b: Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, DRAFT Version 2.0, May 2009. • USEPA 2010: Integrated Risk Information System (IRIS) Database (http://cfpub.epa.gov/ncea/iris/index.cfm).

7.3.1 NATURE OF TOXICITY (HAZARD ASSESSMENT)

The following COPCs were considered unlikely to be carcinogenic to humans: No COPCs were available under this classification

The following COPCs are considered to be (probable or possible) carcinogens, as per the Health Canada classification: No COPCs were available under this classification

The following COPC are considered to be (probably not or unlikely to be) carcinogens, as per the Health Canada classification: No COPCs were available under this classification

Carcinogenic potential for the following COPCs is not available: 2,4'-DDE, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-chlordane, dieldrin, endrin, hexachlorobenzene, methoxychlor, mirex, and trans-nonachlor.

Carcinogenic COPCs were also assessed based on non-carcinogenic effects where applicable toxicity values were available.

7.3.2 DOSE RESPONSE ASSESSMENT

The toxicity values used in the HHRA are the chronic doses, generally referred to as the reference dose (RfD) and reference concentrations (RfC) (for non-carcinogenic effects), and cancer slope factors (CSF) and inhalation unit risk factors (URF) (for carcinogenic

effects). An RfD or RfC is an estimate (with uncertainty spanning approximately an order of magnitude or greater) of a daily exposure level for the human population, including sensitive sub-populations, that are not likely to cause an appreciable risk of deleterious effects during a lifetime. Chronic RfDs or RfCs are specifically developed to be protective for long-term exposure to a compound (e.g., a USEPA Superfund program guideline is 7 years to a lifetime). The CSF or URF is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. The CSF or URF is used to estimate an upper-bound probability of an individual potentially developing cancer as a result of a lifetime exposure to a particular level of a potential carcinogen.

7.3.2.1 NON-CARCINOGEN HAZARDS

Non-carcinogenic chemicals cause adverse health effects such as reduced weight gain, irritant effects, effects on various organs or systems, etc. Most often, these are noted in laboratory animal studies at dose levels much higher than those encountered in the environment. From a review of all available studies, a critical study, often that of the most sensitive species (the species showing a toxic effect at the lowest administered dose or concentration) is selected for derivation of an RfD or RfC. This is based on the concept that there is a threshold concentration, below which, there are no apparent adverse health effects. An RfD or RfC is derived using a dose or concentration level that resulted in no adverse effects (no observed adverse effect level [NOAEL]) or only minimal effects (lowest observed adverse effect level [LOAEL]). Various uncertainty factors are then applied to the NOAEL or LOAEL to derive a RfD or RfC. The uncertainty factors (UFs) utilize, as needed, a factor of 10 to extrapolate a LOAEL to a NOAEL, a factor of 10 to extrapolate from a shorter than lifetime sub-chronic study to a chronic lifetime study, a factor of 10 to extrapolate from animals to humans, and a factor of 10 to protect sensitive populations. A modifying factor (MF) typically of 3 or so may also be included to address datasets lacking certain key studies. These factors are multiplied together and act as the denominator to the NOAEL or LOAEL in the calculation of the RfD or RfC as follows:

$$RfD/RfC = \frac{NOAEL\ or\ LOAEL}{UF_1 \times UF_2 \times UF_3 \ldots}$$

RfDs and RfCs are developed for the oral and inhalation exposure pathways, respectively. These are an oral reference dose (RfDo) in mg/kg-day, and reference concentration (RfC) in mg/m^3.

Table F.16 of Appendix F presents the COPC non-carcinogenic toxicity data (RfDs) used to estimate human health effects for the oral and dermal exposure routes, and Table F.17 of Appendix F presents the COPC non-carcinogenic toxicity data (RfCs) used to estimate human health effects for the inhalation exposure route, which have also been summarized below.

NON-CARCINOGENIC TOXICOLOGICAL REFERENCE VALUES (TRVs)						
COPC	*Oral/Dermal Reference Dose (RfD)*			*Inhalation Reference Concentration (RfC)*		
	Oral/Dermal RfD (mg/kg-day)	*Target Organ*	*Source*	*Inhalation RfC (mg/m^3)*	*Target Organ*	*Source*
2,4′-DDE	--	--	--	--	--	--
4,4′-DDD	--	--	--	--	--	--
4,4′-DDE	--	--	--	--	--	--
4,4′-DDT	1.00E-02	--	Health Canada [1]	--	--	--
alpha-Chlordane	5.00E-04	liver	IRIS [1]	--	--	--
Dieldrin	1.00E-04	--	Health Canada [1]	3.50E-04	--	RIVM
Endrin	3.00E-04	liver	IRIS [1]	--	--	--
Hexachlorobenzene	5.00E-04	--	Health Canada [1]	--	--	--
Methoxychlor	1.00E-01	--	Health Canada [1]	--	--	--
Mirex	2.00E-04	liver	IRIS [1]	--	--	--
Trans-nonachlor	--	--	--	--	--	--

Notes:
--, Not Available
[1] Health Canada, 2009b: Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, DRAFT Version 2.0, May 2009.
US EPA 2010: Integrated Risk Information System (IRIS), http://www.epa.gov/iris
RIVM: Re-evaluation of Human-Toxicological Maximum Permissible Risk Levels, RIVM Report 711701 025, March 2001.

7.3.2.2 CARCINOGENIC RISKS

Determination of a chemical's potential to cause carcinogenic effects in humans is based on available studies in laboratory animals and humans and a weight-of-evidence determination. Health Canada has developed a weight-of-evidence classification system for chemicals based on the extent to which the available data indicate that an agent is a potential human carcinogen. The classification is as follows:

- Group I Carcinogenic to Humans
- Group II Probably Carcinogenic to Humans
- Group III Possibly Carcinogenic to Humans

- Group IV Unlikely to be Carcinogenic to Humans
- Group V Probably Not Carcinogenic to Humans
- Group VI Unclassifiable with Respect to Carcinogenicity to Humans

Slope factors and URFs are developed based on the concept of "no threshold", or the concept that there is no level of exposure to a carcinogen that does not pose a finite probability, however small, of presenting a carcinogenic hazard. A slope factor is, in general, the upper 95th percent confidence limit of the slope of the dose-response curve.

Slope factors are developed separately for oral/dermal and inhalation pathways. These are an oral/dermal cancer slope factor (CSFo) in $(mg/kg\text{-}day)^{-1}$ and either an inhalation cancer slope factor (CSFi) in $(mg/kg\text{-}day)^{-1}$ or an inhalation unit risk factor (URF) in $(mg/m^3)^{-1}$.

The recent Health Canada (HC) PQRA Part II (2009b) TRV listing was consulted to determine the carcinogenicity classification for pesticide COPCs, however none of these COPCs are included in this reference and Health Canada does not provide Weight of Evidence system classifications for the COPCs. The Guidelines for Canadian Drinking Water Quality fact sheet for Aldrin and Dieldrin (CCME, 1995) indicates that the International Agency for Research on Cancer has determined that aldrin and dieldrin are not classifiable as to their carcinogenicity in humans, owing to inadequate evidence of carcinogenicity in humans and limited evidence of carcinogenicity in experimental animals. The acceptable daily intake used in calculation of the maximum acceptable concentration for aldrin and dieldrin in drinking water was therefore based on non-carcinogenic toxicity values from the World Health Organization, which are the same values provided by USEPA (USEPA, 2010). The Ontario Ministry of Environment Rationale for the Development of Soil and Groundwater Standards for use at Contaminated Sites in Ontario (MOE, 2009) also do not classify dieldrin as to its carcinogenicity and refer only to non-carcinogenic toxicity values from USEPA.

Table F.18 of Appendix F presents the COPC carcinogenic toxicity data (CSF) used to estimate human health effects for the oral and dermal exposure routes, and Table F.19 of Appendix F presents the COPC carcinogenic toxicity data (URFs) used to estimate human health effects for the inhalation exposure route, which have been summarized below.

CARCINOGENIC TOXICOLOGICAL REFERENCE VALUES (TRVs)					
COPC	*Weight of Evidence* [1]	*Oral/Dermal Cancer Slope Factor (mg/kg-day)* $^{-1}$	*Source*	*Inhalation Unit Risk Factor (URF) (mg/m*^{3}*)*$^{-1}$	*Source*
2,4'-DDE	--	--	--	--	--
4,4'-DDD	--	2.40E-01	IRIS [2]	--	--
4,4'-DDE	--	3.40E-01	IRIS [2]	--	--
4,4'-DDT	--	3.40E-01	IRIS [2]	--	--
alpha-Chlordane	--	3.50E-01	IRIS [2]	--	--
Dieldrin	--	--	--	--	--
Endrin	--	--	--	--	--
Hexachlorobenzene	--	8.30E-01	Health Canada [2]	--	--
Methoxychlor	--	--	--	--	--
Mirex	--	--	--	--	--
Trans-nonachlor	--	--	--	--	--

Notes:

--, Not Available

[1] Group I - Carcinogenic to Humans; Group II - Probably Carcinogenic to Humans; Group III - Possibly Carcinogenic to Humans; Group IV - Unlikely to be Carcinogenic to Humans; Group V - Probably Not Carcinogenic to Humans; Group VI - Unclassifiable with Respect to Carcinogenicity in Humans.

[2] US EPA 2010: Integrated Risk Information System (IRIS), http://www.epa.gov/iris
Health Canada, 2009b: Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, DRAFT Version 2.0, May 2009.

7.3.3 PRODUCTS OF BIODEGRADATION

2,4'-DDE, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-chlordane, dieldrin, endrin, hexachlorobenzene, methoxychlor, mirex, and trans-nonachlor are not known to commonly biodegrade to produce other COPCs not already considered in the assessment.

7.4 RISK CHARACTERIZATION

The objective of the quantitative risk characterization for the HHRA is to integrate information developed in the exposure assessment (Section 7.2) and the toxicity assessment (Section 7.3) into a complete evaluation of the potential human health risks associated with exposure to soil, garden produce and fish tissue for the potentially complete exposure pathways at the Site. The quantitative risk characterization conducted consists of determining the hazard index and cancer risk posed by all COPCs at the Site. Exposure and risk characterization equations and sample calculations are included in Appendix H.

The receptors considered in the HHRA included a resident, recreational user and construction/utility workers. The following media and potential human exposures (i.e., complete pathways) have been quantitatively evaluated in the HHRA:

1. Soil - Future Condition:
    - Incidental ingestion of soil by residents, recreational users and construction/utility workers
    - Dermal contact with soil by residents, recreational users and construction/utility workers
    - Inhalation of airborne vapours (from soil) by residents, recreational users and construction/utility workers
    - Inhalation of indoor air vapours (from soil) by residents
2. Backyard Garden Produce – Future condition:
    - Ingestion of backyard garden produce (grown in Site soil) by residents
3. Fish Tissue – Future condition:
    - Ingestion of fish tissue by residents

The estimated cancer risk and hazard posed by each COPC to each receptor at the Site are summarized in the following sections.

7.4.1 HAZARD/RISK ESTIMATES

Non-Cancer Hazard Estimates

The potential for non-cancer health effects from exposure to a COPC is evaluated by comparing an exposure level over a specified time period to a reference dose (RfD) for a

similar time period. This ratio, termed the hazard quotient, is calculated according to the following general equation:

$$\mathbf{HQ} = \frac{\mathbf{CDI}}{\mathbf{RfD\ or\ RfC}}$$

Where:

HQ = the Hazard Quotient (unitless) is the ratio of the exposure dose of a chemical to a reference dose not expected to cause adverse effects from a lifetime exposure. When evaluating COPC in each Site media separately (excluding background estimated daily intakes (EDI) from off-site sources including consumer product, food, air and water), a hazard quotient equal to or below 0.2 is deemed negligible and considered protective of human health. This is consistent with CCME (2010) and Health Canada (2009a) and is considered standard practice in Canada.

CDI = the Chronic Daily Intake, or exposure, is the chemical dose calculated by applying the exposure scenario assumptions and is expressed either as mg/(kg-day) for ingestion and dermal exposure and as mg/m^3 for inhalation exposures. The intake represents the average daily chemical dose or concentration over the expected period of exposure.

RfD = the Reference Dose is a daily dose believed not to cause an adverse effect from a lifetime exposure [mg/(kg-day)]. The RfD is based on experimental data and/or epidemiological studies.

RfC = the Reference Concentration is a daily concentration believed not to cause an adverse effect from even a lifetime exposure [mg/m^3]. The RfC is based on experimental data.

The calculated HQs resulting from exposure to each COPC in each exposure route/media are compared to Health Canada's target HQ of 0.2 (Health Canada, 2009a). The calculation of HQs for each of the resident, recreational user and construction worker receptors are presented in Tables F.21 to F.23 (Appendix F), respectively. The calculated HQs are summarized in the tables presented in Section 7.4.1 and in Tables F.24 to F.26 (Appendix F). If the HQ for a receptor, for an individual COPC in an individual media is greater than 0.2, then the individual COPC in the media may pose a potential hazard to human health of the receptor.

Evaluating each individual chemical in individual exposure route/media against an allowable target HQ of 0.2 essentially allots 20% of allowable Site exposure to each exposure route/media. Dieldrin is the only COPC that is present in more than one site

media (soil, fish and potentially garden vegetables). In addition to the HQ evaluation in individual media, Tables F.21 through F.26 include a calculation of total HQ across all on-Site media for dieldrin (also referred to as a Hazard Index (HI)). The tables also include a calculated HQ for dieldrin based on off-site sources (the estimated daily intake (EDI) of dieldrin from off-site sources, divided by the total allowable daily intake (TDI) for dieldrin (the RfD). Table F.20 presents the derivation of the EDI for dieldrin.

When the HQ for dieldrin from all on-Site sources is added to the HQ for dieldrin from off-site sources, it can be compared to an allowable HQ of 1, as 100% of potential sources of dieldrin have been taken into account for each receptor. These total Dieldrin HQs (on-site and off-site) are also presented in Tables F.21 through F.26.

Cancer Risk Estimates

Exposure scenarios may involve potential exposure to a carcinogen through more than one pathway (e.g., oral, dermal, and inhalation). To represent the potential carcinogenic effects posed by multiple pathways, it is assumed that these risks are additive. Cancer risks are calculated utilizing the following general equation:

$$\textit{Cancer Risk} = \textit{CDI} \times (\textit{CSF or URF})$$

Where:

Cancer Risk = estimated upper bound risk of cancer over a lifetime in an individual exposed to the carcinogen for a specified exposure period (unitless).

CDI = the Chronic Daily Intake of, or exposure to, the chemical is calculated using exposure scenario assumptions and is expressed either in mg/kg-day for oral and dermal exposure or in mg/m^3 for inhalation exposure. The chronic daily intake represents the total lifetime chemical dose averaged over an individual expected lifetime.

CSF = the Cancer Slope Factor models the potential carcinogenic response and is expressed as $[mg/(kg\text{-}day)]^{-1}$.

URF = the inhalation Unit Risk Factor models the potential carcinogenic response and is expressed as $[mg/m^3]^{-1}$.

The potential cancer risks resulting from exposure to each carcinogenic COPC are compared to Health Canada's target risk of 1×10^{-5}, or 1 in 100,000, as presented in Health Canada, 2009a. The calculation of cancer risk for each of the resident, recreational user and construction worker receptors are presented in Tables F.21 to F.23 (Appendix F), respectively. The individual cancer risk for each individual carcinogenic COPC are

summarized in the tables presented in Section 7.4.2 and in Tables F.24 to F.26 (Appendix F). If the individual cancer risk is greater than 1.0×10^{-5}, then the individual COPC may pose a potential risk to human health for the receptor in question.

In addition to the evaluation of individual cancer risk from exposure to each carcinogenic COPC, and considering that the carcinogenic COPC are all pesticides, the individual cancer risks for the COPCs were summed to obtain a total cancer risk from all carcinogenic COPCs.

7.4.1 QUANTITATIVE INTERPRETATION OF HEALTH RISKS

The calculation of the hazard and cancer risk posed by each individual COPC to each receptor for all applicable exposure pathways are summarized in the tables below.

Resident (infant, child, toddler, teen, and adult)

The cancer risk/non-cancer hazard quotient (HQ) calculations for each COPC identified for the resident exposure to COPCs in soil through direct contact (incidental ingestion, dermal contact, ambient air inhalation and indoor air inhalation) and fish tissue through ingestion are presented in Table F.21 of Appendix F, and summarized in Table F.24 of Appendix F. Since there were no carcinogenic COPC identified in soil, carcinogenic risk from exposure to soil was not calculated. The cancer risk and HQ results for each COPC are summarized in the table below.

Summary of Calculated Carcinogenic Risk and Non-Carcinogenic Hazard Quotients for Exposure of the Resident								
Receptor	*Medium*	*Route*	*COPC*	*Total Cancer Risk*	*Risk >10^{-5}*	*Hazard Quotient*	*HQ >0.2*	*Appendix F Table Reference*
Resident	Soil	Ingestion	Dieldrin	NC	NA	1.52E-01	No	Table F.21
		Dermal	Dieldrin	NC	NA	3.28E-02	No	
	Ambient Air	Vapour Inhalation	Dieldrin	NC	NA	2.24E-03	No	
	Indoor Air	Indoor Air Inhalation	Dieldrin	NC	NA	2.10E-03	No	
	Garden Produce	Ingestion	Dieldrin	NC	NA	9.19E-01	**Yes**	
	Fish Tissue	Ingestion	2,4'-DDE	NC	NA	NC	NA	
			4,4'-DDD	2.22E-08	No	NC	NA	
			4,4'-DDE	2.83E-07	No	NC	NA	
			4,4'-DDT	4.58E-08	No	2.56E-05	No	
			alpha-Chlordane	4.42E-08	No	4.80E-04	No	
			Dieldrin	NC	NA	5.19E-03	No	
			Endrin	NC	NA	4.09E-04	No	
			Hexachlorobenzene	4.21E-08	No	1.93E-04	No	
			Methoxychlor	NC	NA	2.56E-06	No	
			Mirex	NC	NA	3.47E-04	No	
			Trans-nonachlor	NC	NA	NC	NA	

Notes:
NA Not Applicable
NC Not Calculated

The target non-carcinogenic HQ of 0.2 was not exceeded for the identified COPC (dieldrin) for the resident's ingestion or dermal contact exposure to soil or the inhalation exposure to ambient air and indoor air (via soil). Therefore there was no unacceptable hazard identified for the resident receptor's exposure to soil via these exposure pathways.

The target carcinogenic risk of 1.0×10^{-5} and the target non-carcinogenic HQ of 0.2 were not exceeded for any of the identified COPCs for the resident's ingestion exposure to COPCs in fish tissue. Therefore there was no unacceptable carcinogenic risk or non-carcinogenic hazard identified for the resident through the ingestion of fish caught from on-site ponds.

There were no carcinogenic COPC identified in soil, therefore there was no unacceptable carcinogenic risk identified through exposure to soil.

The non-carcinogenic HQ for the resident's exposure to dieldrin through ingestion of garden produce grown in Site soil exceeded the target non-carcinogenic hazard of 0.2. As seen in Table F.21, when the HQ for dieldrin from all on-Site sources is added to the HQ for dieldrin from off-site sources (taking into account the EDI), the resulting Hazard Index also exceeds the allowable HI of 1, indicating a potential hazard to the on-site

residential receptor from exposure to dieldrin, primarily due to exposure to ingestion of on-site garden produce. These calculations are based on the maximum dieldrin in soil concentration. Site-specific target levels (SSTLs) for dieldrin in soil, in order to be protective of the resident receptor, are therefore calculated in Section 7.5.

It is noted that the maximum Site dieldrin in soil concentration is located within the area of former SCF infrastructure, which is not intended for development at this time. The above results confirm that these former infrastructure areas would require further assessment and evaluation of risks if they were planned for development in the future.

Recreational User – Undeveloped Areas (infant, child, toddler, teen, and adult)

The recreational user is intended to assess whether dieldrin in soil concentrations located in areas not intended to be developed will pose an unacceptable risk/ hazard to receptors accessing the area for recreational purposes. It is assumed that there will be no buildings and no backyard gardens in this undeveloped area.

The non-cancer hazard calculations for the recreational user exposure to the identified COPC in soil (dieldrin), through direct contact (incidental ingestion, dermal contact, and ambient air inhalation) are presented in Table F.22 of Appendix F, and summarized in Table F.25 of Appendix F. Since there were no carcinogenic COPCs identified in soil, carcinogenic risk from soil exposure was not calculated. The HQ results for the recreational receptor are summarized in the table below.

Summary of Calculated Carcinogenic Risk and Non-Carcinogenic Hazard Index for Exposure of the Recreational User

Receptor	*Medium*	*Route*	*COPC*	*Total Cancer Risk*	*Risk >10^{-5}*	*Hazard Quotient*	*HQ >0.2*	*Appendix F Table Reference*
Recreational User	Soil	Ingestion	Dieldrin	NC	NA	4.18E-02	No	Table F.22
		Dermal	Dieldrin	NC	NA	8.99E-03	No	
	Ambient Air	Vapour Inhalation	Dieldrin	NC	NA	6.15E-04	No	

Notes:
NA Not Applicable
NC Not Calculated

The target non-carcinogenic HQ of 0.2 was not exceeded for the recreational user's ingestion or dermal contact exposure to soil or the inhalation exposure to ambient air (via soil). Therefore there was no unacceptable hazard identified for the recreational receptor's exposure to soil.

Construction/Utility Worker

The non-cancer hazard calculations for the constriction worker's exposure to the identified COPC in soil (dieldrin), through direct contact (incidental ingestion, dermal contact, and ambient air inhalation) are presented in Table F.23 of Appendix F, and summarized in Table F.26 of Appendix F. Since there are no carcinogenic COPCs identified in soil, carcinogenic risk from soil exposure was not calculated. The HQ results for the construction worker receptor are summarized in the table below.

Summary of Calculated Carcinogenic Risk and Non-Carcinogenic Hazard Index for Exposure of the Construction/Utility Worker

Receptor	*Medium*	*Route*	*COPC*	*Total Cancer Risk*	*Risk >10^{-5}*	*Total Hazard Index*	*HI >0.2*	*Appendix F Table Reference*
Construction /Utility Worker	Soil	Ingestion	Dieldrin	NC	No	1.13E-02	No	Table F.23
		Dermal	Dieldrin	NC	No	5.67E-02	No	
	Ambient Air	Vapour Inhalation	Dieldrin	NC	No	3.69E-03	No	

Notes:
NA Not Applicable
NC Not Calculated

The target non-carcinogenic HQ of 0.2 was not exceeded for the construction worker's ingestion or dermal contact exposure to soil or the inhalation exposure to ambient air (via soil). Therefore there was no unacceptable hazard identified for the construction worker receptor's exposure to soil.

7.5 DERIVATION AND SUMMARY OF SITE-SPECIFIC TARGET LEVELS

In accordance with Health Canada (Health Canada 2009a) guidance, Site-specific target levels (SSTL) were developed for the COPCs and exposure pathways that exceed the carcinogenic risk and/or non-carcinogenic hazard levels of 1.0E-05 and 0.2, respectively. Therefore, an SSTL was developed for dieldrin in soil for the following exposure pathway.

- SSTL for Dieldrin in Soil - Resident on-site garden produce ingestion exposure pathway – Section 7.5.1

As demonstrated in Table F.24 (Appendix F, the non-carcinogenic HQ calculated for direct exposure to soil (via soil ingestion, dermal contact and ambient air inhalation

combined) was 0.187. Since this is approaching the target of 0.2, an SSTL was also developed for soil for the following exposure pathways.

- SSTL for Dieldrin in Soil - Resident direct contact with soil (ingestion, dermal contact and inhalation pathways) – Section 7.5.2

The assumptions utilized in the derivation of pathway-specific SSTLs are the same as those used in the forward hazard and risk calculations, as summarized in Section 7.2.4. The equations are also the same; however, they are used in reverse to back calculate soil concentrations that are protective of human health in order to meet the target risk/hazard levels.

7.5.1 DIELDRIN IN SOIL SSTL – RESIDENT ON-SITE GARDEN PRODUCE INGESTION

Table F.27 of Appendix F presents the derivation of the SSTL for soil based on the resident's exposure to dieldrin in garden produce grown in Site soil and compares the soil SSTL to the maximum detected soil concentration. Results are summarized below.

COPC, Media and Exposure	*Site-Specific Target Level (mg/kg)*	*Maximum Detected Soil Concentration (mg/kg)*	*Number of Samples >SSTL (%)*
Dieldrin in Soil – Resident Ingestion of On-Site Garden Produce	**0.98**	**4.5**	**5 (6.25 %)**

The soil SSTL developed for the protection of residents from exposure to dieldrin from ingestion of garden produce grown in Site soil was exceeded at five locations (SS1, SS2, SS4, SS5 and TP-10). The soil samples exceeding SSTLs are generally located within the area of former SCF infrastructure, which is not intended for development at this time. The previously identified petroleum hydrocarbon and potential metals impacts in soil requiring further assessment are also located within this area of former SCF infrastructure. However, sample SS5 is located southeast of the former SCF infrastructure area. It is therefore recommended that the area surrounding sample SS5 (proposed Lots 129 to 132) be included in the area not intended for residential cottage development unless remediation or further soil and/or vegetation sampling, analyses and risk assessment is completed in this area (see Figures 11a and 11b).

7.5.2 DIELDRIN IN SOIL SSTL – RESIDENT DIRECT EXPOSURE TO SOIL

Table F.28 of Appendix F presents the derivation of the SSTL for dieldrin in soil based on the resident's direct exposure to soil, through ingestion, dermal contact and inhalation, and compares the soil SSTL to the maximum detected soil concentration. Results are summarized below.

COPC, Media and Exposure	*Site-Specific Target Level (mg/kg)*	*Maximum Detected Soil Concentration (mg/kg)*	*Number of Samples >SSTL (%)*
Dieldrin in Soil – Resident Direct Soil Ingestion, Dermal Contact and Inhalation	**4.8**	**4.5**	**0 (0 %)**

As indicated in the table above, the SSTL developed for the protection of residents from direct exposure to dieldrin in soil has not been exceeded at the Site.

7.6 UNCERTAINTIES

COPCs were identified for the Site based on a review of known historical and current activities. Potential COPCs identified included pesticides, petroleum hydrocarbons and suspected metals (from previous use of lead based paint on former buildings. Although petroleum hydrocarbon COPCs exceeded the screening, they have not been evaluated in this HHRA as it focuses on pesticides. Potential metal in soil impact have also not been evaluated as there is no data available at this time. However, the area of former infrastructure is not included in the development plans at this time, so the potential risk to the proposes cottage development from petroleum hydrocarbons and metals is considered to be negligible. If it is considered for development in the future, additional analyses and risk assessment would be required. Although the information obtained during the historical review is considered sufficient to determine potential COPCs in this case, some uncertainty may also exist if unknown uses of the property occurred, which could have introduced different chemicals of concern than those evaluated. This could result in an underestimation of risk.

Soil sampling programs have been conducted within the Site. Through this sampling program, the presence of pesticide COPCs on the Site has been adequately characterized and no significant data gaps with respect to pesticides exist. Quality assurance/quality control (QA/QC) programs were implemented during the sampling programs, and the quality assessment and validation of the data collected demonstrate that the analytical

results are consistent, are of high quality, and are suitable for use in the RA. There is minimal uncertainty associated with the quality of the data collected through the sampling programs, and these data are suitable for setting and meeting the objectives of the RA.

It is noted that all elevated dieldrin in soil concentrations were from samples obtained in 2004 and subsequent sampling in 2009 in areas near the 2004 sample locations results in significantly lower dieldrin concentrations. The inclusion of the 2004 data may therefore overestimate risk, as dieldrin is known to degrade over time. The 2004 data were included in the risk assessment for conservatism, however additional soil sampling in elevated dieldrin concentration areas may indicate lower dieldrin levels than measured in 2004.

With regards to the exposure assumptions, there is always a level of uncertainty introduced with each assumption that is utilized. However, the tendency in the risk characterization was to select conservative, health-protective values to guard against underestimating exposure and associated risk. This leads to general overestimating in all assumptions

Overall, the tendency in the risk characterization was to select conservative, health-protective values to guard against underestimating exposure and associated risk. This leads to a general overestimating in all assumptions. When more than one overestimate of individual assumptions are included in the scenario equations, they are multiplied. This exaggerates the overestimation of each assumption and leads to a risk characterization that is protective.

7.6.1 UNCERTAINTY IN TOXICITY FACTORS

One of the major uncertainties in the quantification of risk or in the derivation of risk-based assessment criteria involves the application of toxicity information. Some of the uncertainties associated with the toxicity values applied in this HHRA are presented below:

- Chemicals may be assumed to be human carcinogens based on animal studies even when there is limited or no available evidence that the chemical is a human carcinogen. Such chemicals may not actually be carcinogenic in humans, and therefore overestimate the potential risk levels. Candidates for long-term carcinogenicity studies in laboratory animals are typically selected based on preliminary evidence that indicates a potential concern. Included are results of short-term mutagenicity studies, chemical class considerations, or presence of structural elements that are similar to those present on known carcinogens. While many high priority chemicals have been studied, not all chemicals have undergone testing for carcinogenesis and as a result, some chemicals that have not been tested may actually be carcinogenic and therefore could pose a cancer risk. However, the toxicity data applied herein are the data currently accepted by Canadian jurisdictions, based on the current state of the science regarding potential health effects caused by chemical exposure and therefore are appropriate.
- Cancer Slope Factors (CSFs) and Unit Risk Factors (URFs) are derived from study data on animals dosed with high concentrations, and therefore may not be applicable to the evaluation of low concentration exposures. High doses of chemicals may overwhelm the detoxification or excretion capabilities of an organism and allow the chemical to impact the target cells, and therefore result in an overestimation of the risk and provide lower, more conservative risk based concentrations or site specific target levels (SSTLs). In cases where chemicals are activated to carcinogens by metabolism, tumor incidence may not increase at higher dose levels because the responsible metabolic pathway becomes saturated. The impact of this response on derived CSFs and URFs is unclear because derivation of CSFs and URFs involves fitting experimental data to a dose-response model and linearly extrapolating the curve through the origin. The slope of this linear portion of the curve is used to derive CSFs and URFs. As such, the impact of saturation at high doses on the extrapolated linear low-dose portion of the dose-response curve is uncertain.
- CSFs and URFs are developed in a conservative manner. The models used by Health Canada, USEPA, and other agencies make a number of conservative assumptions that may overestimate carcinogenic potency by several orders of magnitude, possibly resulting in an overestimate of the risk and providing lower, more conservative SSTLs.
- RfDs and RfCs are also established with factors of uncertainty in comparison to actual studies resulting in conservative reference values. For example, it is assumed that all chemicals are more toxic to humans than to the test animals studied while the opposite may be true. This may result in an overestimation of the non-carcinogenic health effects and provide lower, more conservative SSTLs.

- Compounds lacking toxicity data could not be included in the toxicity assessment. Ultimately, this lack of data results in the exclusion of these compounds from the risk characterization portion of the HHRA. The exclusion of detected compounds from the risk assessment due to a lack of toxicity factors could lead to an underestimation of the risk to human receptors. However, compounds excluded from this HHRA for this reason were also not considered to be related to past use of chemicals on site, and were only analyzed as they were included in the laboratory's suite of analyses for pesticides.

8.0 CONCLUSIONS

A supplemental assessment program was completed between November 2010 and December 2010 to evaluate environmental conditions at the former Salmonier Correctional Facility (SCF) in Salmonier, NL. The former SCF property is approximately 902 hectares in size with approximately 53 hectares of the property previously used for operation of the former SCF as agricultural lands or buildings and associated infrastructure. The remainder of the property is undeveloped land containing a mixture of mature boreal forest, water bodies, and bog/fen wetlands. The intended future land use of the Site is redevelopment for cottage lots (approximately 340 cottage lots). The purpose of the supplemental assessment program was to collect additional environmental data from selected on-Site ponds to supplement surface water, sediment, groundwater and soil data collected from the Site between 2004 and 2010. Results of the previous sampling programs indicated that pesticides were detected or exceeded applicable environmental quality benchmarks in some of the soil and sediment samples collected in the vicinity of the former agricultural areas.

The supplemental HHERA field program included collection of additional information on sediment and fish tissue from selected on-Site ponds as well as an evaluation of habitat in selected areas of the Site and was focused on the potential presence of pesticides and herbicides in environmental media from the past usage of these chemicals in former agricultural areas of the Site. Pesticides and herbicides were not detected in Site groundwater or surface water. Results of the previous investigations also identified petroleum hydrocarbon impacted soils exceeding applicable Atlantic PIRI RBSLs in the vicinity of former on-Site SCF buildings, but petroleum hydrocarbons were not included in the field program scope of work since no development of the former SCF infrastructure area is planned.

The supplemental work program included the collection of 4 sediment samples and 40 fish tissue samples. Samples were analyzed for selected pesticides, lipids, fraction of organic carbon, and/or grain size. Toxicological tests were completed on sediment samples collected from four on-Site ponds (sediment benthos survival and growth testing and fathead minnow survival testing). Benthic density and diversity analysis were also conducted on sediment samples collected from the four selected ponds.

The results of the 2010 sampling program together with the data previously collected by MGI and SNC between 2004 and 2010 was used to complete a quantitative HHERA to determine if chemicals potentially associated with the SCF present an unacceptable risk to ecological receptors or human health for the proposed redevelopment as cottage properties. Although the PSAP and subsequently the HHERA sampling plan focused

on pesticides/herbicides as the primary COPC in the areas proposed for reevelopment, the screening portion of the HHERA evaluation included all COPCs analyzed, including petroleum hydrocarbons. Only COPCs considered to be present in the proposed areas of redevelopment (pesticides) were carried forward to the quantitative HHERA stage..

The following provides a summary of the ERA completed for the Site:

- Results of the preliminary quantitative ERA determined concentrations of pesticides detected in soil and sediment do not present an unacceptable risk to terrestrial or semi-aquatic receptors in the area. In particular, simple food chain models were used to determine pesticide concentrations in soil and sediment do not pose risk to terrestrial, aquatic or semi-aquatic mammals and birds.
- The sediment triad evaluation completed as part of the ERA also determined detectable concentrations of pesticides/herbicides in sediment of the on-Site ponds are not toxic to freshwater invertebrates or juvenile fish. Furthermore, the diversity of benthic macroinvertebrate communities in two of the three selected on-Site ponds is similar to the reference pond. The quantity and diversity of macroinvertebrates in the sediment samples collected from Oxley's Pond were however significantly reduced from the other pond samples. The reason for the reduced benthic diversity is not known but may be related to rocky substrate observed in this pond as the toxicity testing indicated that Oxley's Pond sediment is not toxic to benthic organisms.
- Based on the data available, residual pesticide concentrations in soil, sediment and fish tissue do not pose an unacceptable risk to ecological receptors present at the Site or that use the Site as a source of food and further evaluation of risk is not required.

A human health risk assessment was also completed to evaluate potential future receptors which include residents, recreational users and construction/ utility workers. Petroleum hydrocarbons (including benzene, ethylbenzene, toluene, modified TPH (fuel oil source)), and dieldrin were identified as COPCs in soil, as the maximum detected concentrations exceeded the screening criteria. Petroleum hydrocarbon COPCs, present in the former SCF infrastructure area (not planned for redevelopment), were further screened against Atlantic RBCA Tier II pathway-specific screening levels. Results indicated that petroleum hydrocarbon impacts on-Site would only be of concern if there were buildings or potable wells located in the area of the soil exceedances. It is noted that the elevated petroleum hydrocarbons in soil are present within the area formerly developed with SCF infrastructure, which is currently vacant and is not currently intended to be developed for cottage use. In addition to petroleum hydrocarbon COPC, metals COPCs may be also present in soil in this area, due to the possible past use of

lead based paint on the former SCF buildings. The former SCF infrastructure area is indicated on Figures 11a and 11b. If future residential development plans are slated for this area, additional assessment would be required to further assess the potential risk to human resident receptors from petroleum hydrocarbon and potential metals impacts.

Since dieldrin in soil was the only COPC present in areas proposed for redevelopment, it was the only carried forward to quantitative HHRA calculations.

The human-health based screening process also identified 2,4'-DDE, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-chlordane, dieldrin, endrin, hexachlorobenzene, methoxychlor, mirex, and trans-nonachlor as COPCs detected in fish tissue, which were also carried forward for further consideration in the quantitative HHRA.

The following provides a summary of the quantitative HHRA completed for pesticides at the Site:

- Health Canada Protocol (Health Canada, 2009a) was used to evaluate health risk due to exposure to COPCs in soils (dieldrin) and fish tissue (2,4'-DDE, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, alpha-chlordane, dieldrin, endrin, hexachlorobenzene, methoxychlor, mirex, and trans-nonachlor). There were no COPCs identified for groundwater, surface water, or sediment, and therefore these media are not a concern at the Site.
- For soil, the exposure pathways evaluated in the HHRA included incidental ingestion, dermal contact, and inhalation of vapours and soil particulates for future residents, recreational users and construction/utility workers. The resident was also evaluated for potential exposure to COPCs in soil through inhalation of indoor air and exposure to COPCs in backyard garden prouce and fish tissue through ingestion.
- Under the proposed future conditions, the target non-carcinogenic hazard quotient of 0.2 was exceeded for exposure of the resident to dieldrin in garden produce grown in site soil, based on the maximum soil concentration. There were no unacceptable non-carcinogenic hazards or cancer risks identified for the resident through other applicable exposure pathways including direct exposure to soil (ingestion, dermal contact and inhalation), indoor air inhalation and fish ingestion.
- Under the proposed future conditions, there were no unacceptable non-carcinogenic hazards or cancer risks identified for the recreational user or construction worker.
- A Site Specific Target Levels (SSTL) was developed for dieldrin in soil for the resident, based on ingestion of vegetation grown in site soil , as indicated below.

DIELDRIN IN SOIL SSTL – INGESTION OF GARDEN VEGETATION GROWN IN SITE DIRECT EXPOSURE TO SOIL (mg/kg)

COPC	*Site-Specific Target Level (mg/kg)*	*Maximum Detected Soil Concentration (mg/kg)*	*Number of Samples >SSTL (%)*
Dieldrin	**0.98**	**4.5**	**5 (6.25 %)**

The soil SSTL developed for the protection of residents from exposure to dieldrin from ingestion of garden produce grown in Site soil was exceeded at five locations (SS1, SS2, SS4, SS5 and TP-10), which are located within the "Area Requiring Additional Development", as outlined in Figures 11a and 11b. Since this area is not intended for redevelopment, there would be no garden produce grown in this area and therefore no ingestion of garden produce from this area would be possible unless the area were developed in the future.

- A Site Specific Target Level (SSTL) was also developed for dieldrin in soil for the resident, based on direct exposure to soil (ingestion, dermal contact and inhalation), as indicated below.

DIELDRIN IN SOIL SSTL DIRECT EXPOSURE TO SOIL (mg/kg)

COPC	*Site-Specific Target Level (mg/kg)*	*Maximum Detected Soil Concentration (mg/kg)*	*Number of Samples >SSTL (%)*
Dieldrin	**4.8**	**4.5**	**0 (0 %)**

Based on the results of the HHRA, residual dieldrin concentrations in soil, sediment, fish, groundwater and surface water do not pose unacceptable risks or hazards to potential human receptors of the proposed cottage development, conditional on the area outlined in Figures 11a and 11b remaining undeveloped.

9.0 RECOMMENDATIONS

Additional analyses and risk assessment would be required prior to proceeding with residential development within the "Area Requiring Additional Assessment", as defined in Figures 11a and 11b. The recommended "Area Requiring Additional Assessment" illustrated in these figures has been expanded beyond the area of former SCF infrastructure, as discussed below.

The soil SSTL developed for the protection of residents from exposure to dieldrin from ingestion of garden produce grown in Site soil was exceeded at five locations (SS1, SS2, SS4, SS5 and TP-10), which are generally located within former SCF infrastructure area. The previously identified petroleum hydrocarbon and potential metals impacts in soil requiring further assessment are also located within this area. However, sample SS5 is located southeast of the former SCF infrastructure area. It was therefore recommended that the area surrounding sample SS5 (proposed Lots 129 to 132) be included in the area not intended for residential cottage development unless remediation or further soil and/or vegetation sampling, analyses and risk assessment is completed in this area. This additional area has been included in the "Area Requiring Additional Assessment" illustrated on Figures 11a and 11b.

It is also noted that delineation of dieldrin in soil has not been achieved to generic guidelines or garden produce ingestion-based SSTLs north of soil samples SS2 and TP-10. Therefore, it has been recommended that additional soil and/or vegetation sampling be completed north of these sample locations prior to developing proposed lots 116 to 120. The area including these lots was also added to the "Area Requiring Additional Assessment" illustrated on Figures 11a and 11b.

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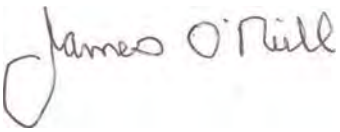
11.0 CLOSURE

All of Which is Respectfully Submitted,
CONESTOGA-ROVERS & ASSOCIATES



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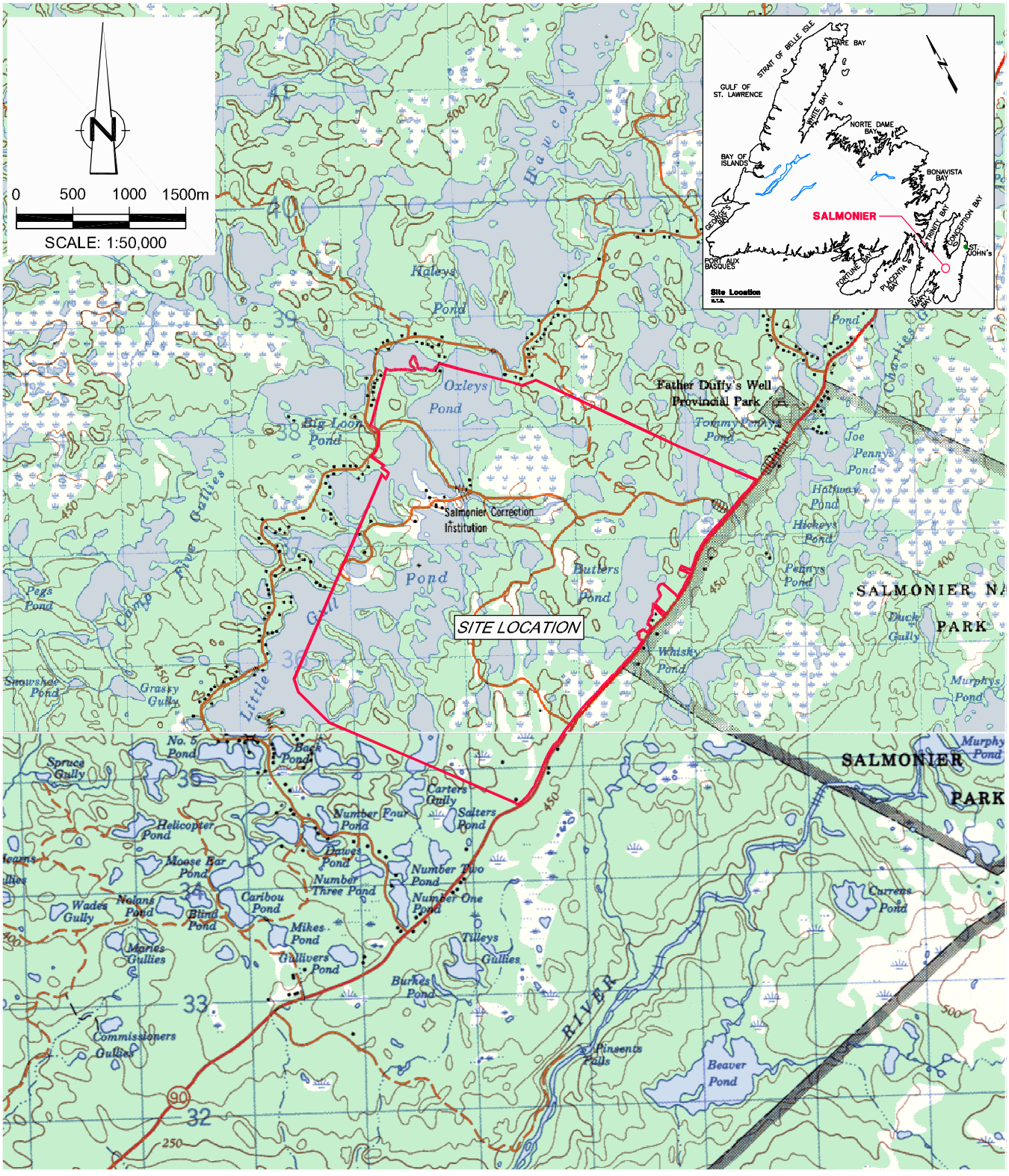
Troy Small, M.Sc.



LEGEND:

APPROX. PROPERTY BOUNDARY (FROM SNC 2010)

figure 1

SITE LOCATION MAP
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL001

LEGEND:

APPROX. SCF PROPERTY BOUNDARY (FROM SNC 2010)

A POND IDENTIFICATION (FROM SNC 2010)

figure 2

SITE PLAN WITH 2008 AERIAL PHOTO OVERLAY
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL002

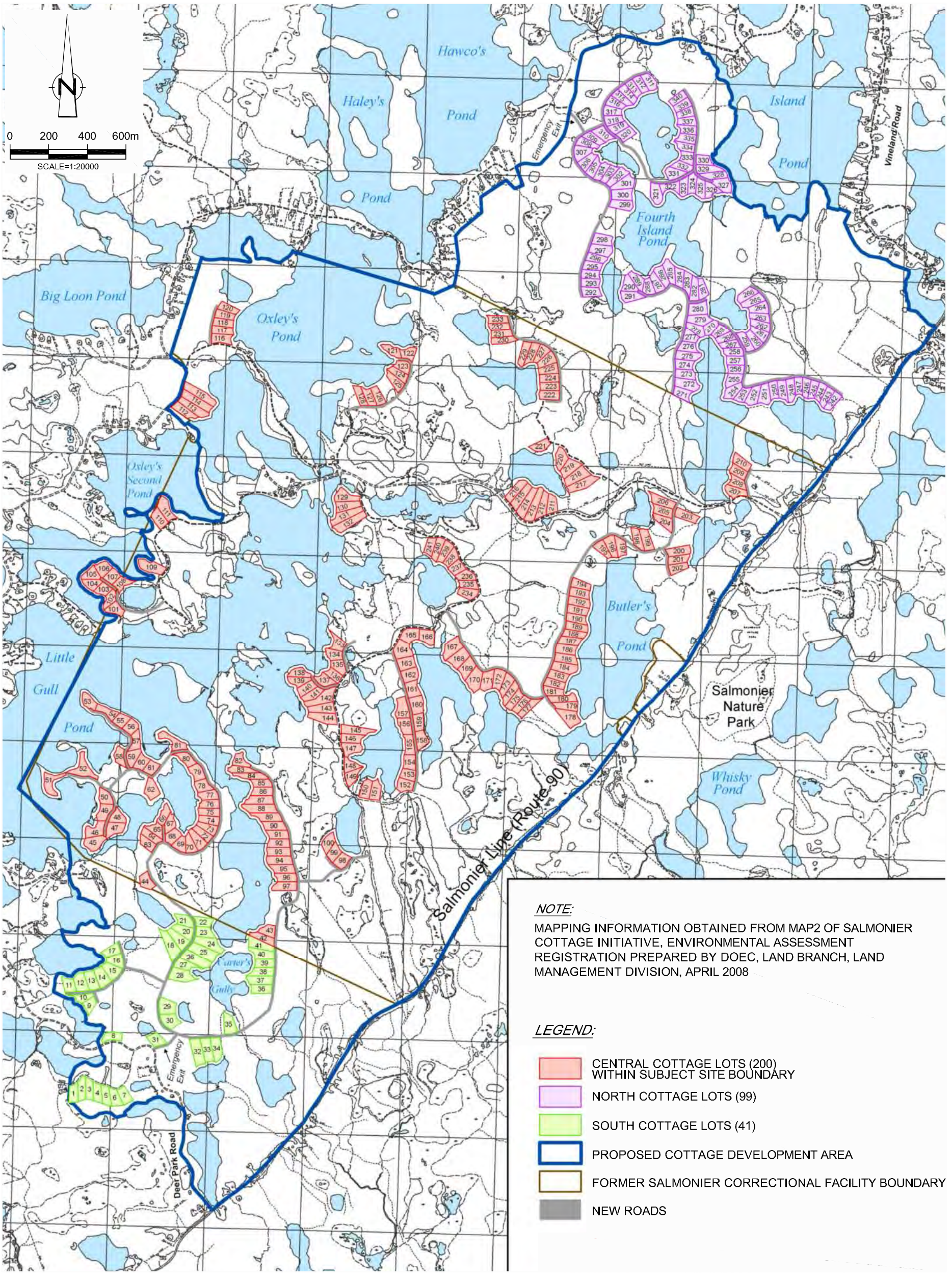


figure 3

PROPOSED REDEVELOPMENT PLAN
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL003

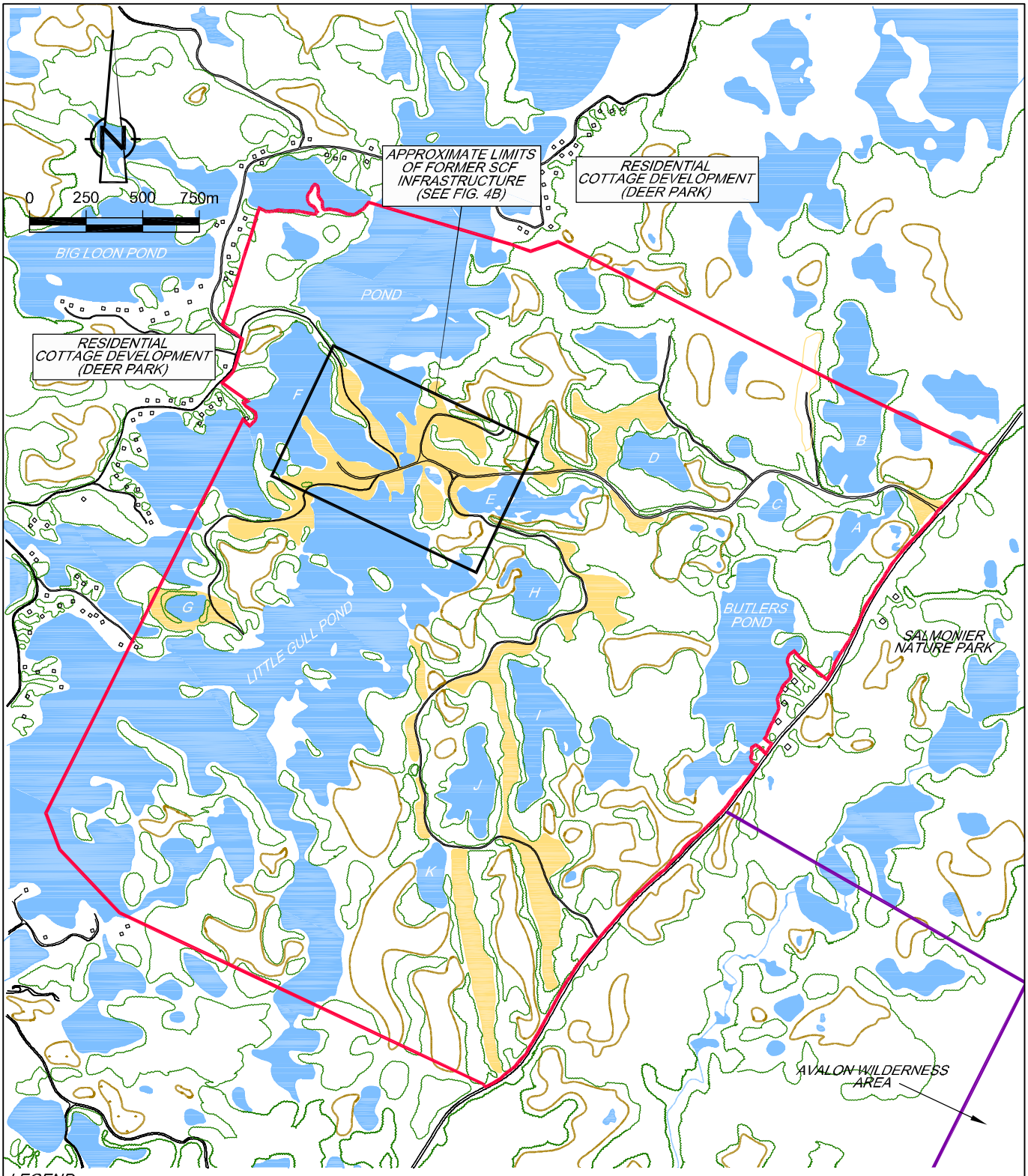


figure 4A

SITE PLAN WITH SURROUNDING PROPERTIES
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL04A

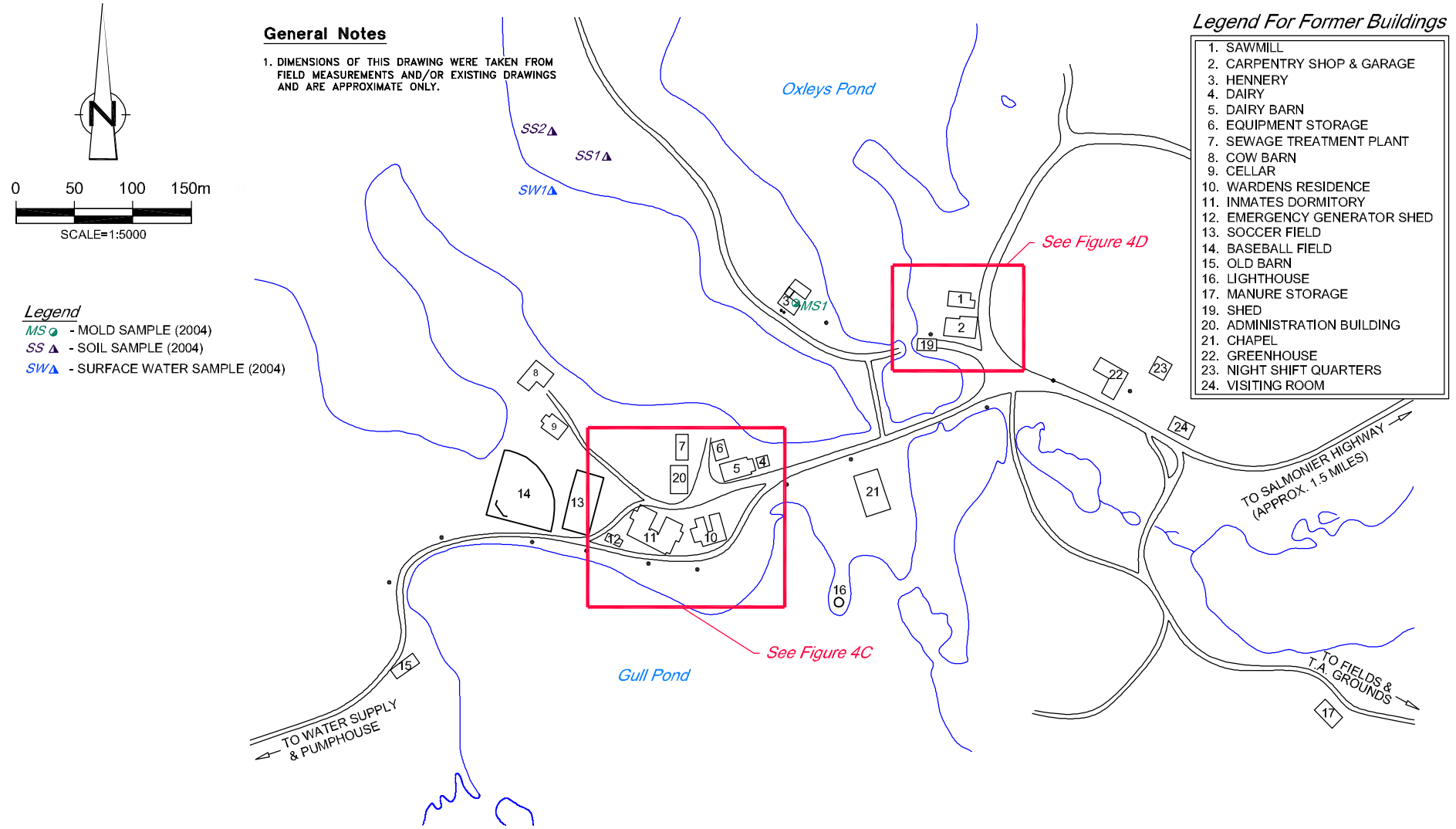
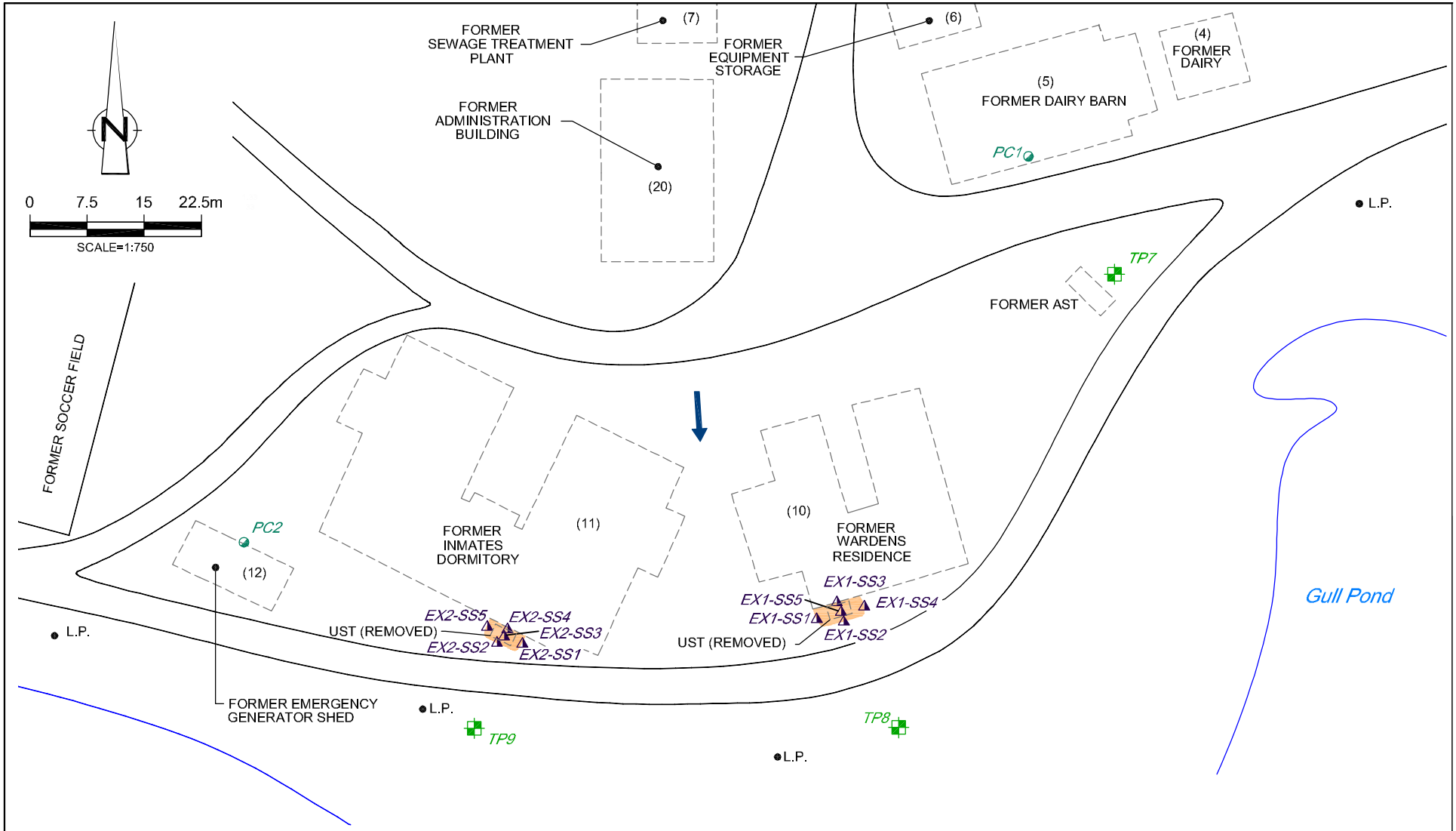


figure 4B

SITE PLAN - FORMER BUILDING LOCATIONS
HUMAN HEALTH AND ECOLOGICAL RICK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL04B



Legend

- *PC* - PAINT CHIP SAMPLE (2004)
- *SS* - SOIL SAMPLE (2004)
- *TP* - TEST PIT (2004)
- APPROX. GROUNDWATER FLOW DIRECTION
- AREA OF EXCAVATION (APPROXIMATE)

figure 4C

SITE PLAN - BUILDINGS 4,5,6,7,10,11,12,20
HUMAN HEALTH AND ECOLOGICAL RICK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

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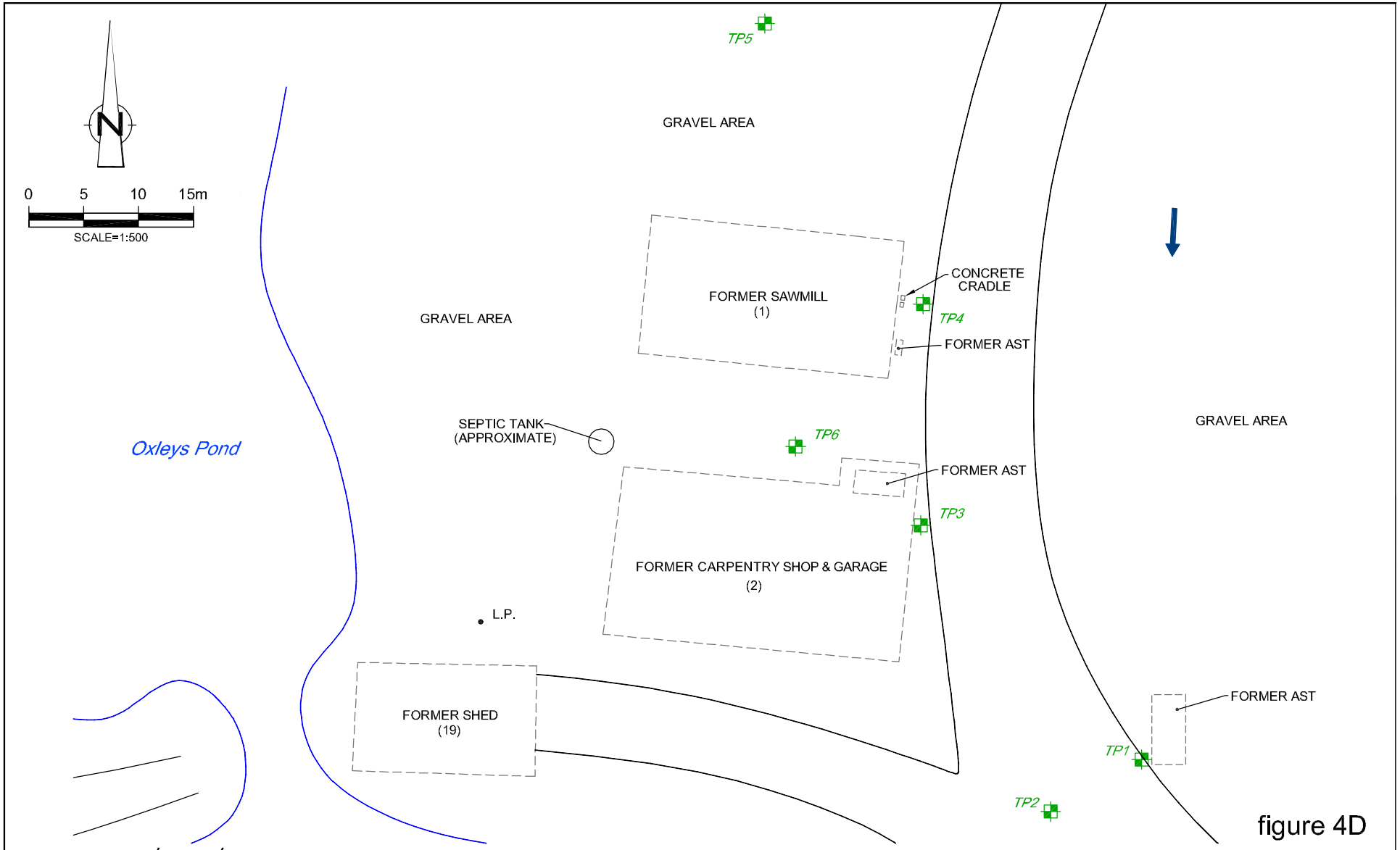
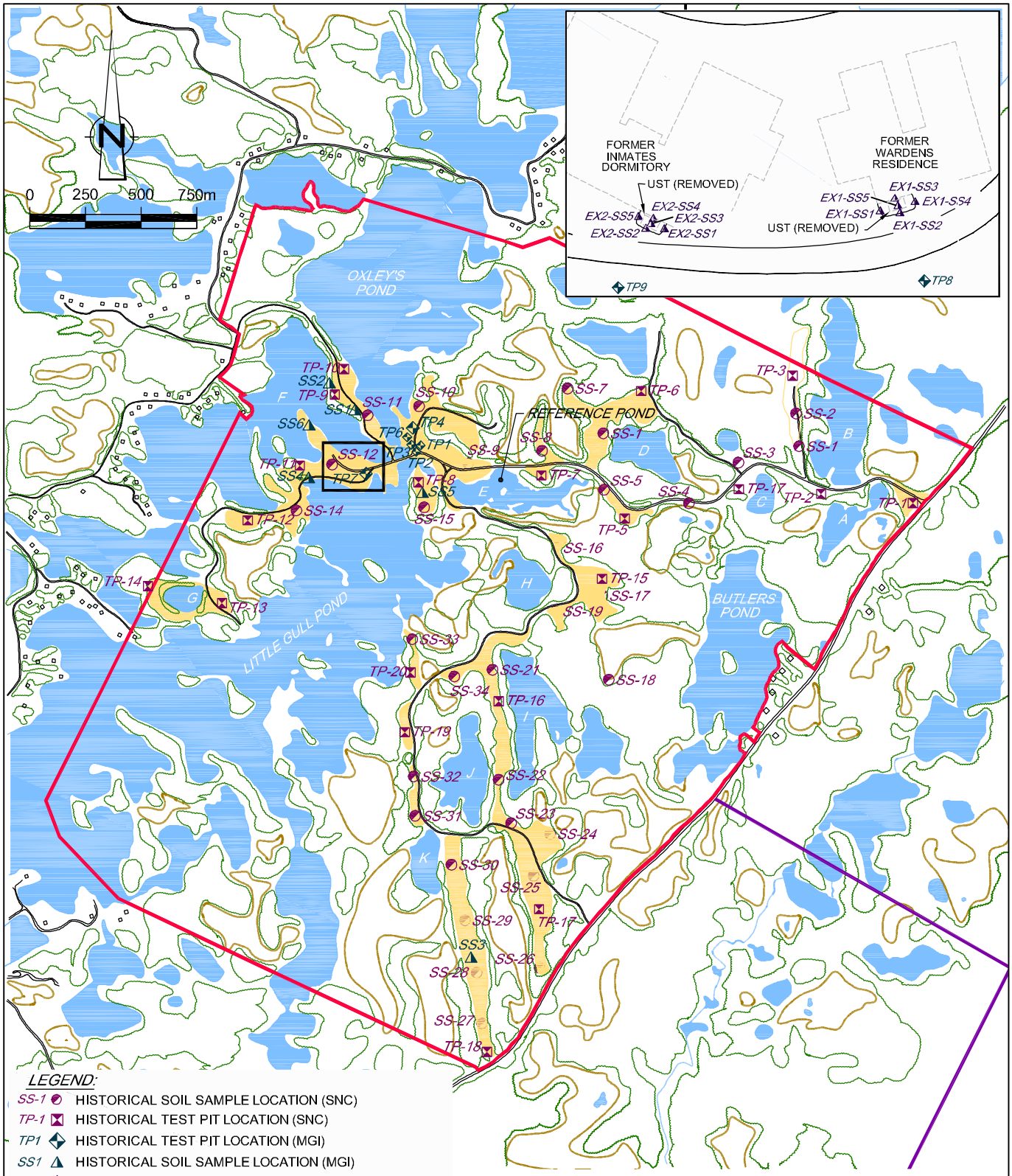


figure 4D

SITE PLAN - BUILDINGS 1,2,19
HUMAN HEALTH AND ECOLOGICAL RICK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL04D



LEGEND:

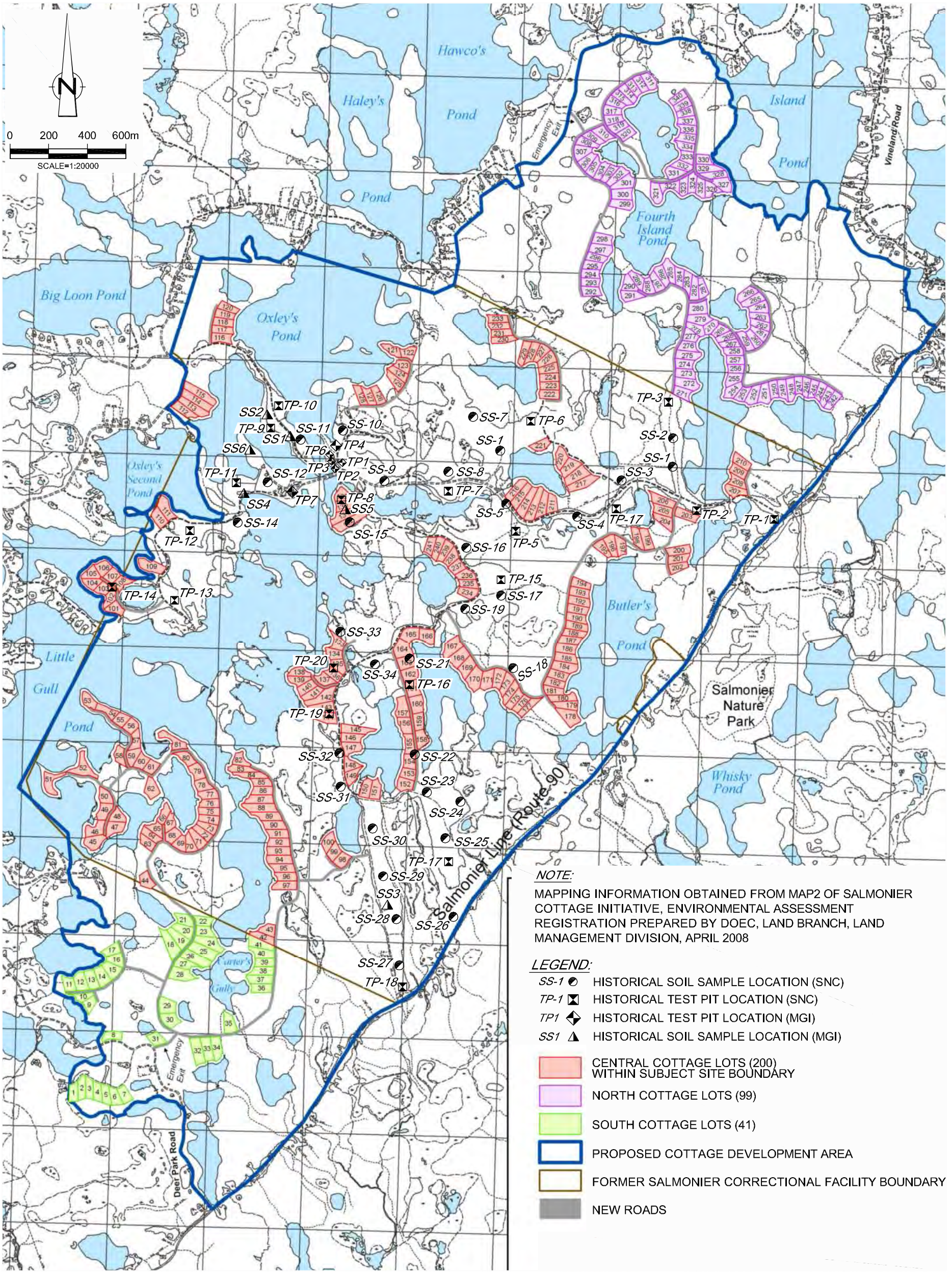
- SS-1 — HISTORICAL SOIL SAMPLE LOCATION (SNC)
- TP-1 — HISTORICAL TEST PIT LOCATION (SNC)
- TP1 — HISTORICAL TEST PIT LOCATION (MGI)
- SS1 — HISTORICAL SOIL SAMPLE LOCATION (MGI)
- SS1 — HISTORICAL SOIL SAMPLE LOCATION (MGI)
- APPROX. SCF PROPERTY BOUNDARY (FROM SNC 2010)
- SWAMPY/BOGGY AREA
- PREVIOUSLY DEVELOPED AREA (INFRASTRUCTURE OR AGRICULTURAL)
- A — POND IDENTIFICATION

figure 5A

HISTORICAL SOIL SAMPLE LOCATIONS
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

CRA

072004 GN-NL05A



NOTE:

MAPPING INFORMATION OBTAINED FROM MAP2 OF SALMONIER COTTAGE INITIATIVE, ENVIRONMENTAL ASSESSMENT REGISTRATION PREPARED BY DOEC, LAND BRANCH, LAND MANAGEMENT DIVISION, APRIL 2008

LEGEND:

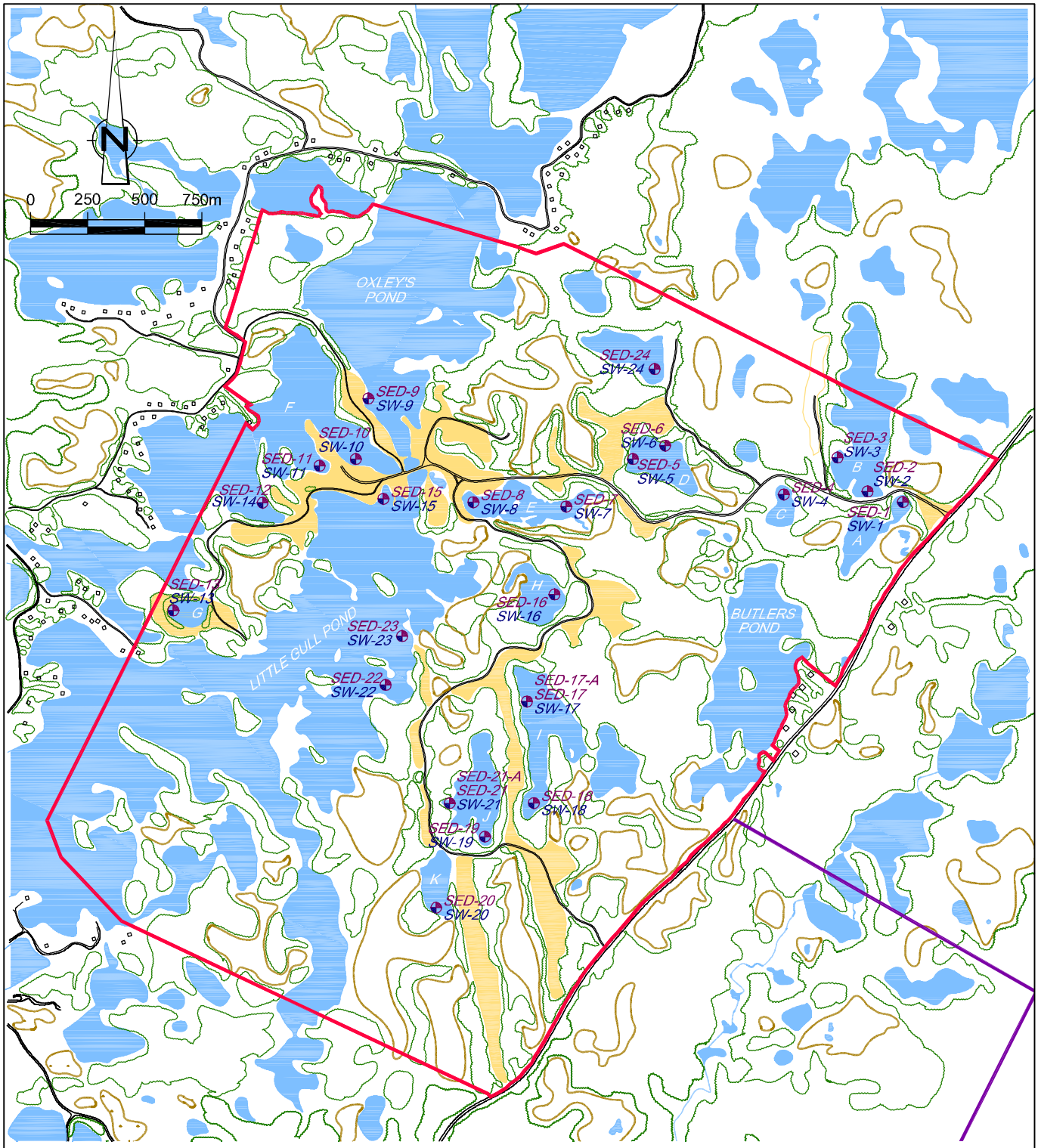
- *SS-1* HISTORICAL SOIL SAMPLE LOCATION (SNC)
- *TP-1* HISTORICAL TEST PIT LOCATION (SNC)
- *TP1* HISTORICAL TEST PIT LOCATION (MGI)
- *SS1* HISTORICAL SOIL SAMPLE LOCATION (MGI)
- CENTRAL COTTAGE LOTS (200) WITHIN SUBJECT SITE BOUNDARY
- NORTH COTTAGE LOTS (99)
- SOUTH COTTAGE LOTS (41)
- PROPOSED COTTAGE DEVELOPMENT AREA
- FORMER SALMONIER CORRECTIONAL FACILITY BOUNDARY
- NEW ROADS

figure 5B

HISTORICAL SOIL SAMPLE LOCATIONS WITH BUILDING LOTS
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

CRA

072004 GN-NL05B



LEGEND:

SED-19 / SW-19 — HISTORICAL SEDIMENT/SURFACE WATER SAMPLE LOCATION (SNC)

APPROX. SCF PROPERTY BOUNDARY (FROM SNC 2010)

SWAMPY/BOGGY AREA

PREVIOUSLY DEVELOPED AREA (INFRASTRUCTURE OR AGRICULTURAL)

A — POND IDENTIFICATION

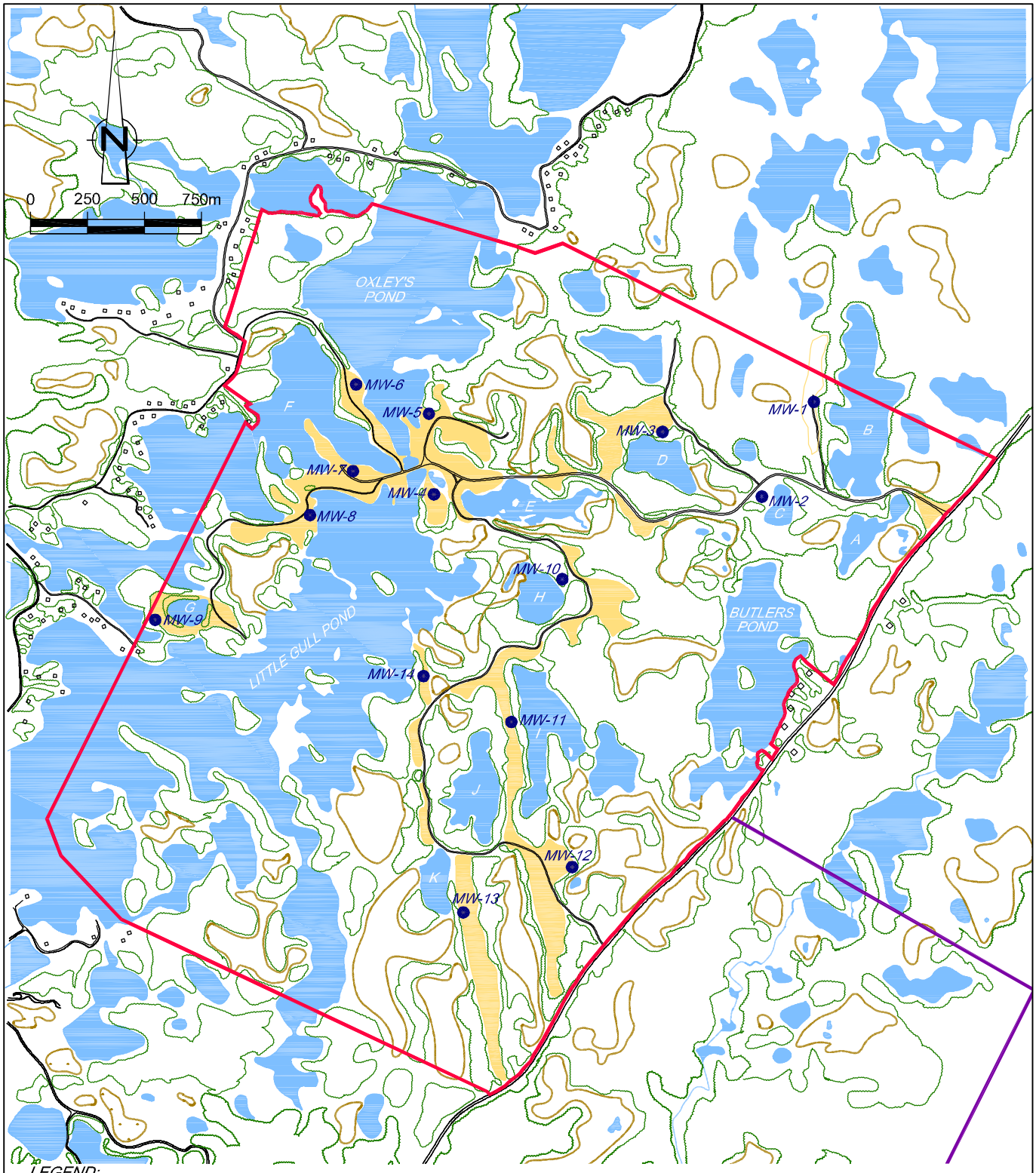
figure 6

HISTORICAL SEDIMENT/SURFACE WATER LOCATIONS
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY

Salmonier, Newfoundland and Labrador

CRA

072004 GN-NL006



LEGEND:

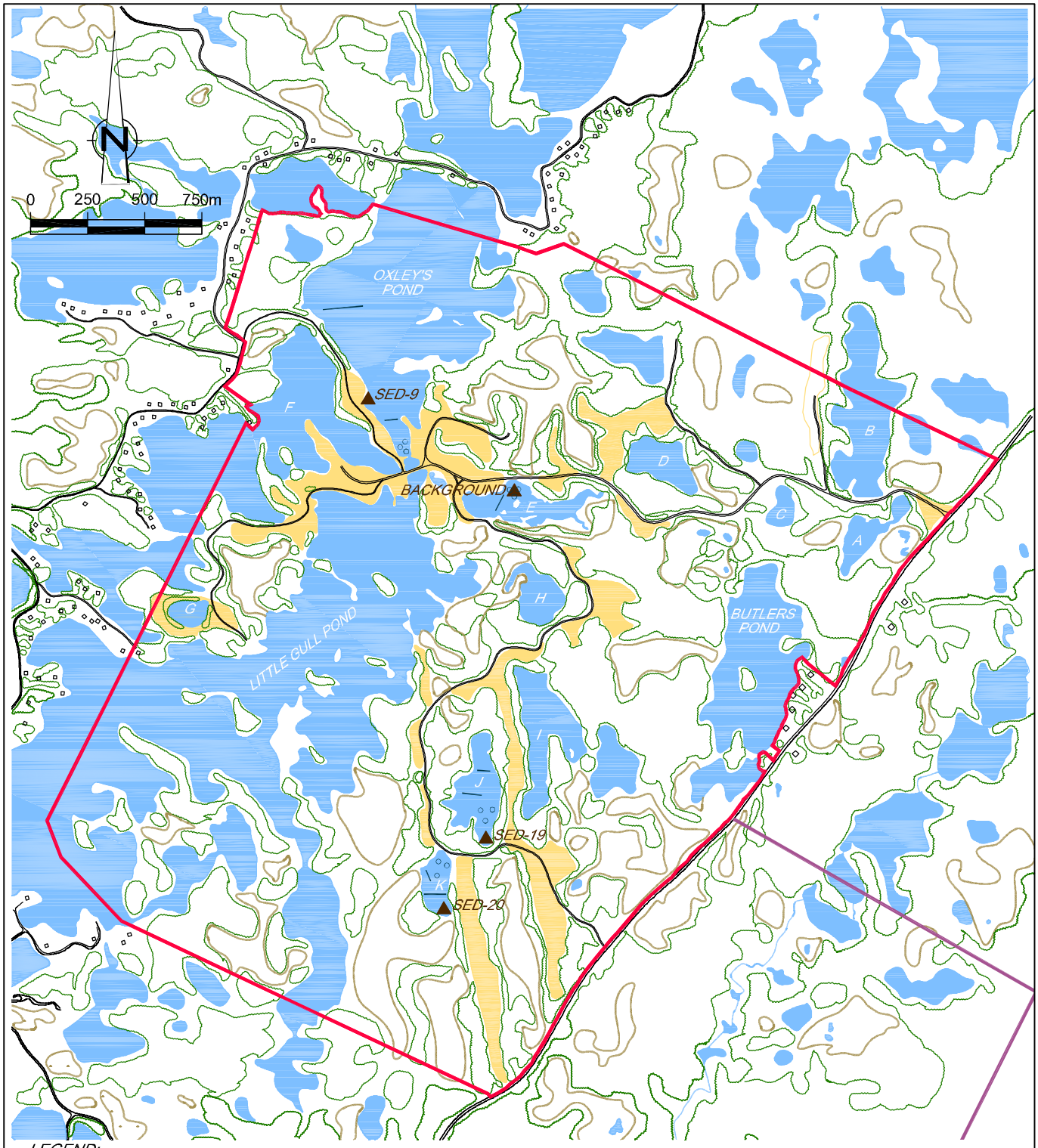
- MW-1 HISTORICAL MONITOR WELL SAMPLE LOCATION (SNC)
- APPROX. SCF PROPERTY BOUNDARY (FROM SNC 2010)
- SWAMPY/BOGGY AREA
- PREVIOUSLY DEVELOPED AREA (INFRASTRUCTURE OR AGRICULTURAL)
- A POND IDENTIFICATION

figure 7

HISTORICAL GROUNDWATER SAMPLE LOCATIONS HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT FORMER SALMONIER CORRECTIONAL FACILITY

Salmonier, Newfoundland and Labrador

072004 GN-NL007



LEGEND:

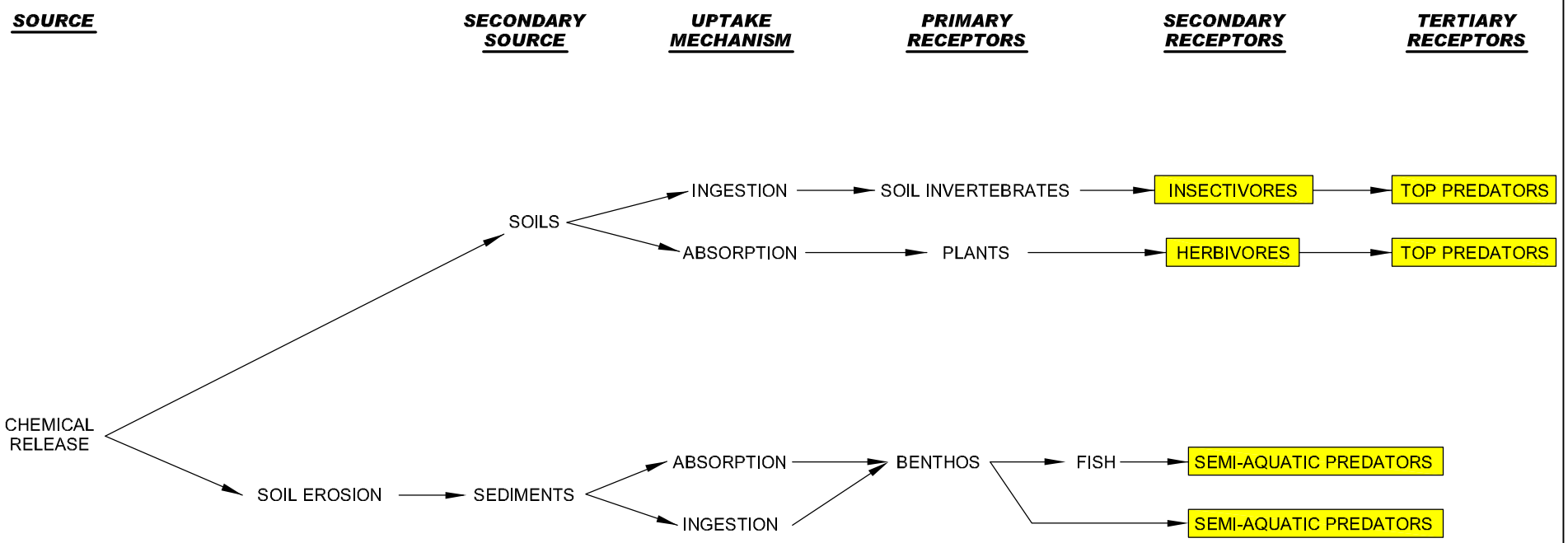
- SED-9 ▲ SEDIMENT SAMPLE LOCATION (CRA 2010)
- FISH NET LOCATION (CRA 2010)
- MINNOW TRAP LOCATION (CRA 2010)
- APPROX. SCF PROPERTY BOUNDARY (FROM SNC 2010)
- SWAMPY/BOGGY AREA
- PREVIOUSLY DEVELOPED AREA (INFRASTRUCTURE OR AGRICULTURAL)
- A POND IDENTIFICATION

figure 8

SEDIMENT AND FISH SAMPLE LOCATIONS - CRA 2010
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY

Salmonier, Newfoundland and Labrador

072004 GN-NL008



LEGEND:

BOXED RECEPTOR IDENTIFIES VEC

figure 9

CONCEPTUAL SITE MODEL - ECOLOGICAL RECEPTORS
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SAMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

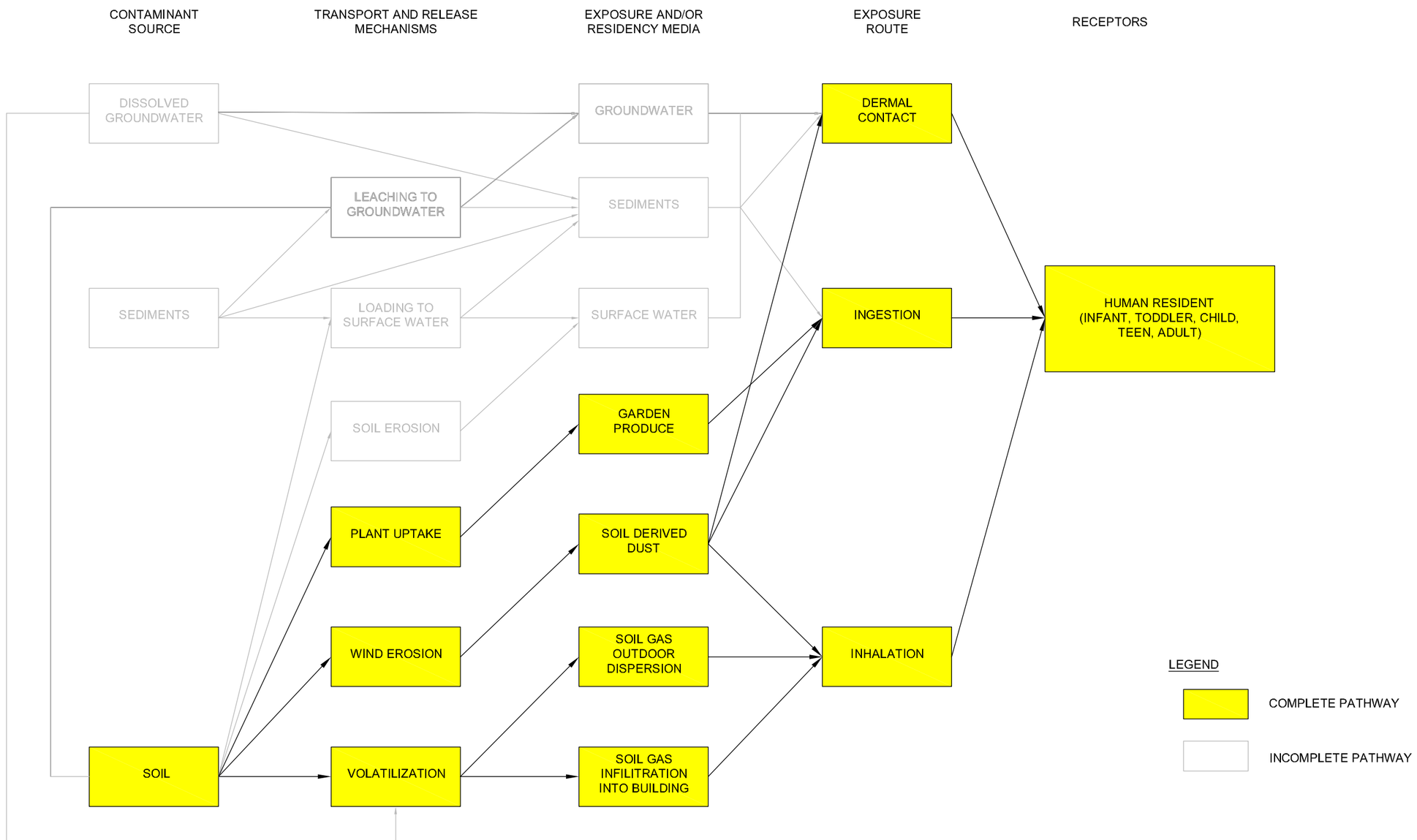


figure 10A

HHRA CONCEPTUAL SITE MODEL - RESIDENT
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL10A

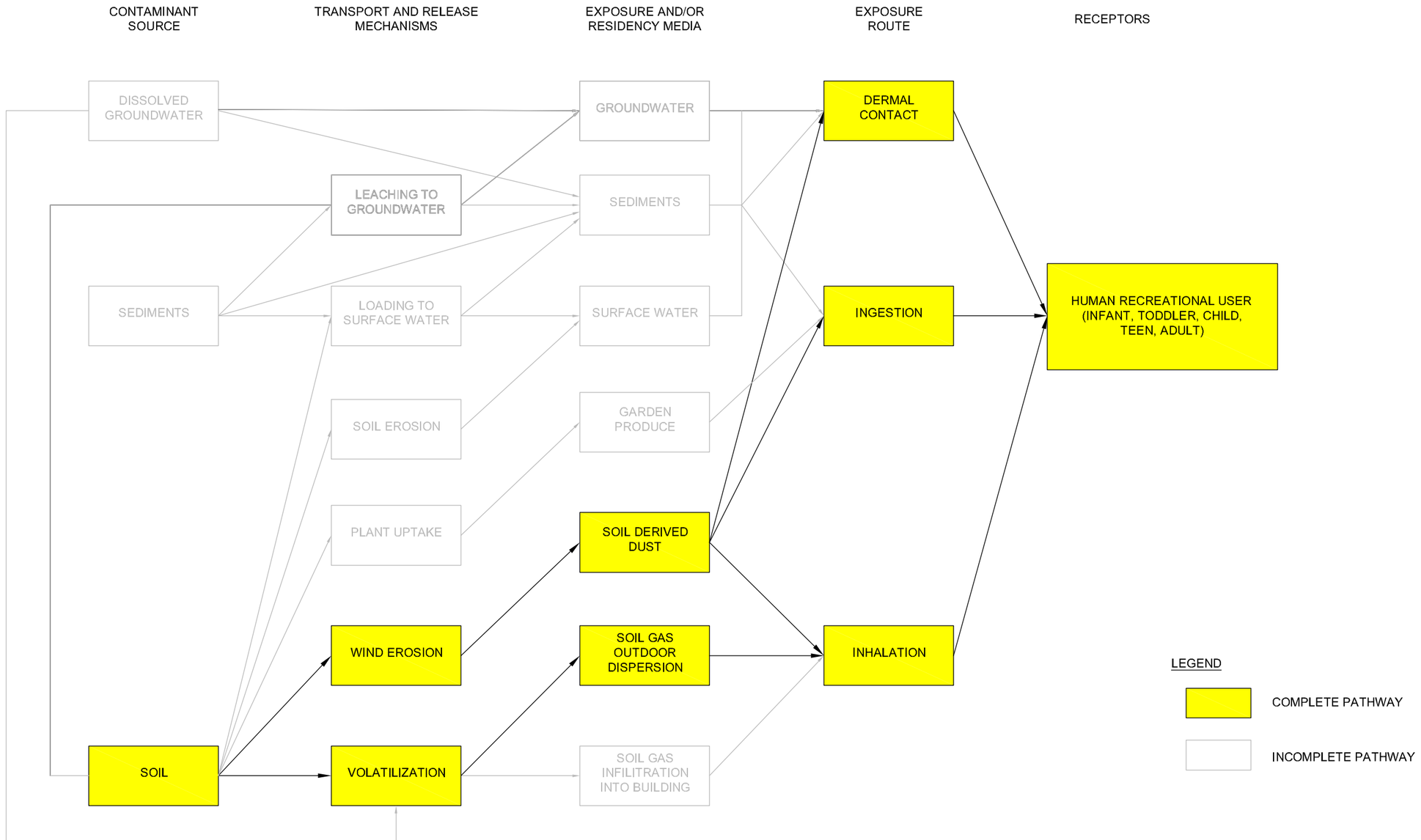


figure 10B

HHRA CONCEPTUAL SITE MODEL - RECREATIONAL USER (UNDEVELOPED AREAS)
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL10B

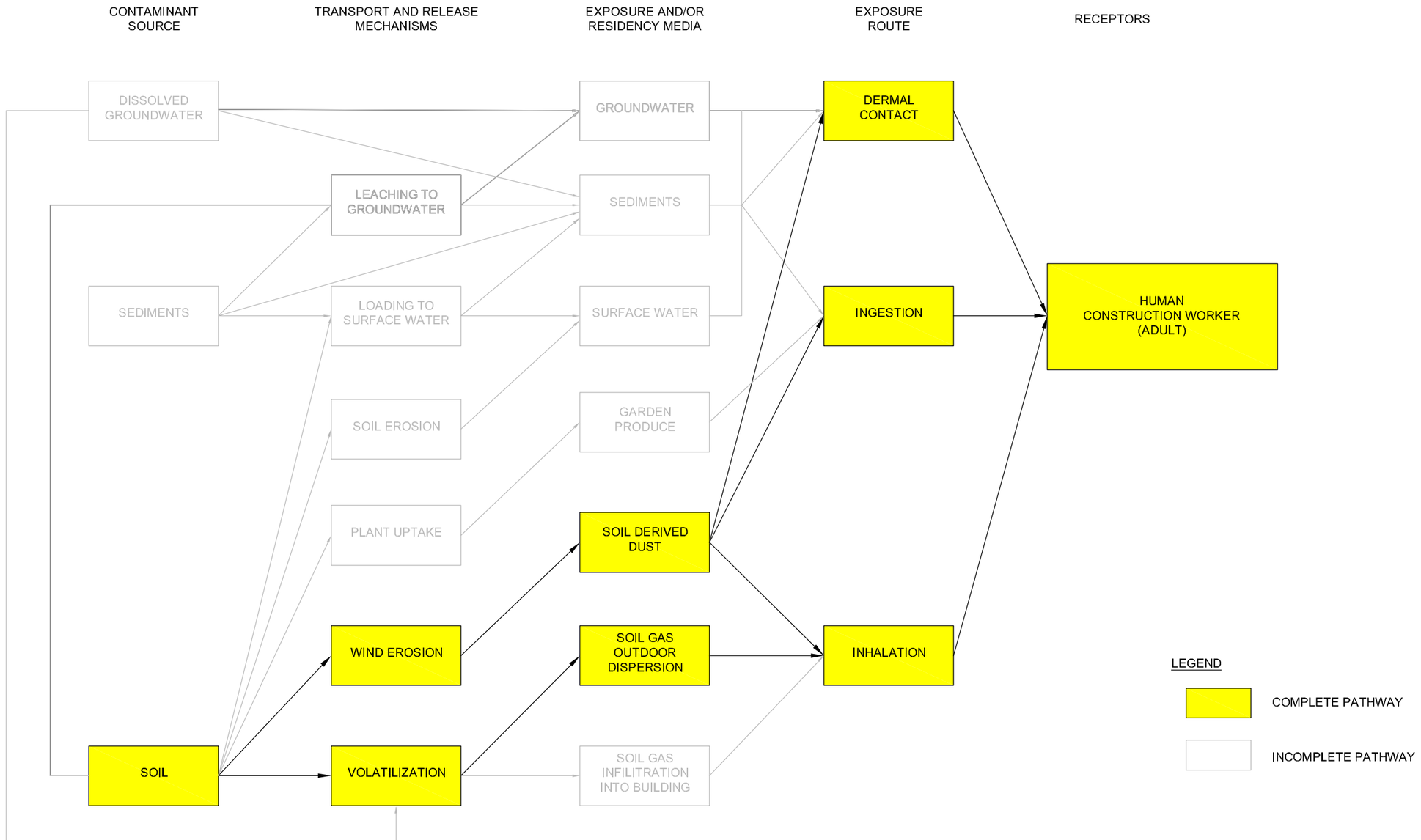
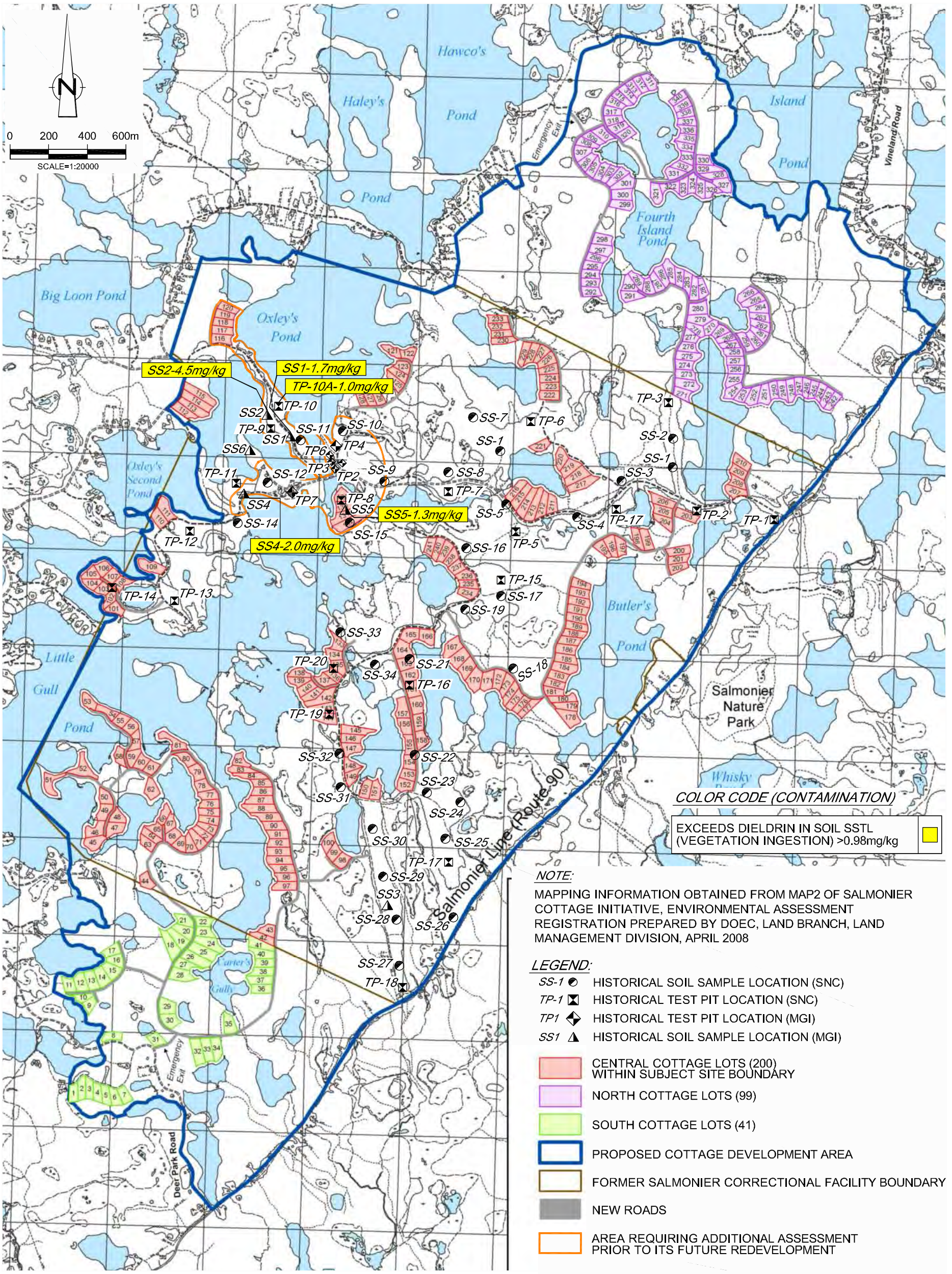


figure 10C

HHRA CONCEPTUAL SITE MODEL - CONSTRUCTION WORKER
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL10C



COLOR CODE (CONTAMINATION)

EXCEEDS DIELDRIN IN SOIL SSTL (VEGETATION INGESTION) >0.98mg/kg	

NOTE:

MAPPING INFORMATION OBTAINED FROM MAP2 OF SALMONIER COTTAGE INITIATIVE, ENVIRONMENTAL ASSESSMENT REGISTRATION PREPARED BY DOEC, LAND BRANCH, LAND MANAGEMENT DIVISION, APRIL 2008

LEGEND:

- *SS-1* HISTORICAL SOIL SAMPLE LOCATION (SNC)
- *TP-1* HISTORICAL TEST PIT LOCATION (SNC)
- *TP1* HISTORICAL TEST PIT LOCATION (MGI)
- *SS1* HISTORICAL SOIL SAMPLE LOCATION (MGI)
- CENTRAL COTTAGE LOTS (200) WITHIN SUBJECT SITE BOUNDARY
- NORTH COTTAGE LOTS (99)
- SOUTH COTTAGE LOTS (41)
- PROPOSED COTTAGE DEVELOPMENT AREA
- FORMER SALMONIER CORRECTIONAL FACILITY BOUNDARY
- NEW ROADS
- AREA REQUIRING ADDITIONAL ASSESSMENT PRIOR TO ITS FUTURE REDEVELOPMENT

figure 11

SOIL SSTL EXCEEDANCES (RESIDENT) WITH BUILDING LOTS
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

CRA

072004 GN-NL011

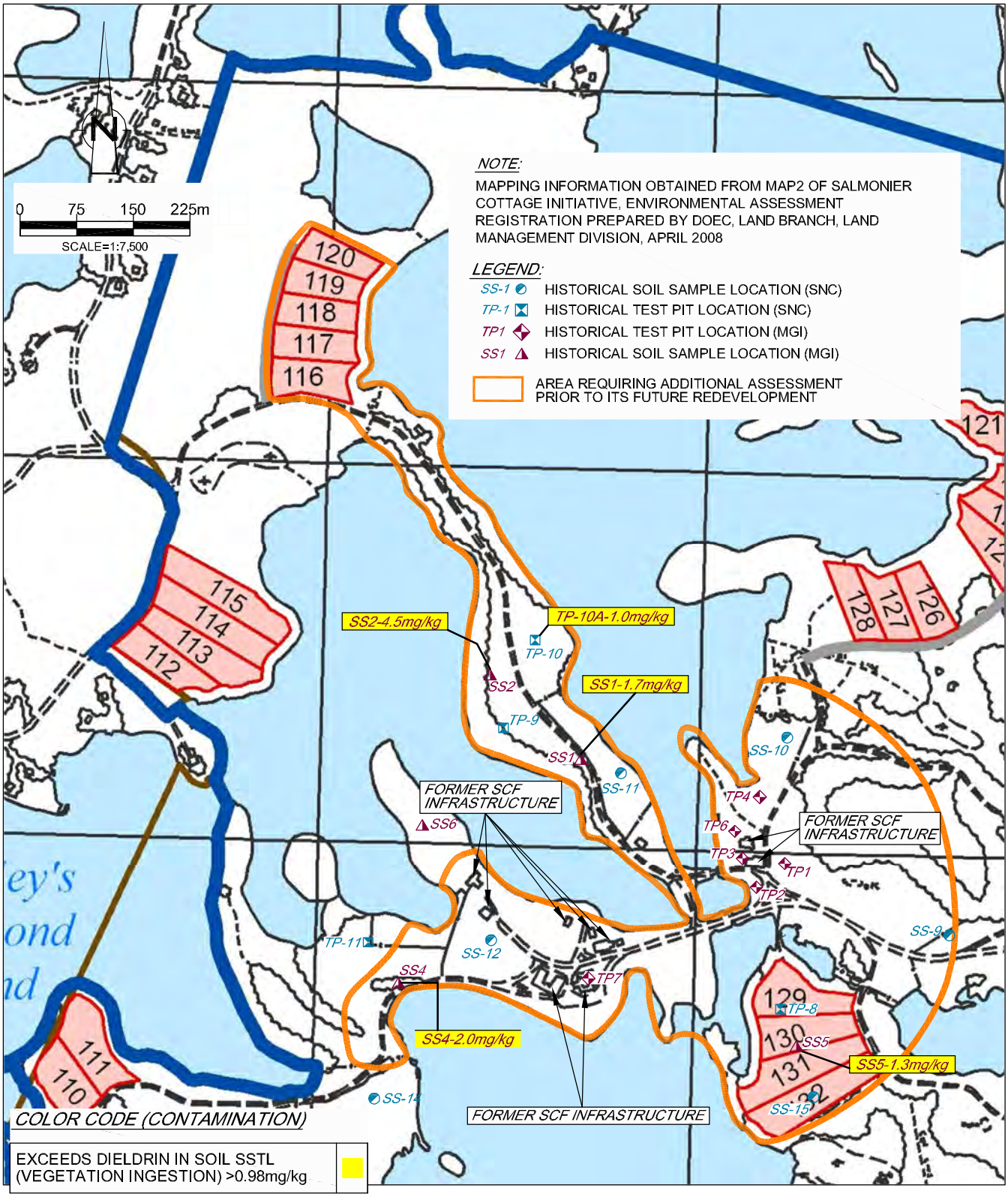


figure 11B

AREA REQUIRING ADDITIONAL ASSESSMENT
PRIOR TO ITS FUTURE REDEVELOPMENT
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL11B

TABLE 1

SUMMARY OF ANALYTICAL TESTING (2010)

Matrix	*Parameter*					
	Pesticides/Herbicides	*Lipids*	*Fraction Organic Carbon*	*Physical (i.e. GSA)*	*Toxicity Testing*	*Benthic Density/Diversity Analysis*
Sediment	4	0	4	4	8	12
Fish Fillets	20	20	0	0	0	0
Whole Fish Tissue	16	16	0	0	0	0

TABLE 2

2010 SEDIMENT ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Sample Location	*SED-9*	*SED-19*	*SED-20*	*Reference*
Sample Date	*11/24/10*	*11/24/10*	*11/24/10*	*11/24/10*
Sample ID:	*Oxley's Pond*	*Pond J*	*Pond K*	*Background Pond*

Parameter	*CCME Interim Sediment Quality Guidelines / Probable Effects Level*				
2,4'-DDD	0.00354/0.00851	<0.0001	<0.0001	<0.0001	<0.0001
2,4'-DDE	0.00142/0.00675	<0.0001	<0.0001	<0.0001	<0.0001
2,4'-DDT	0.00119/0.00477	<0.0001	<0.0001	<0.0001	<0.0001
4,4'-DDD	0.00354/0.00851	<0.0001	<0.0001	<0.0001	<0.0001
4,4'-DDE	0.00142/0.00675	<0.0001	<0.0001	<0.0001	<0.0001
4,4'-DDT	0.00119/0.00477	<0.0001	<0.0001	<0.0001	<0.0001
a-BHC	NS	<0.0001	<0.0001	<0.0001	<0.0001
Acephate	NS	--	--	--	--
a-chlordane	NS	<0.0001	<0.0001	<0.0001	<0.0001
Alachlor	NS	--	--	--	--
Aldrin	NS	<0.0001	<0.0001	<0.0001	<0.0001
Aspon	NS	--	--	--	--
Atrazine	NS	--	--	--	--
Azinphos Ethyl	NS	--	--	--	--
b-BHC	NS	<0.0001	<0.0001	<0.0001	<0.0001
Benfluralin	NS	--	--	--	--
Bromacil	NS	--	--	--	--
Bromophos	NS	--	--	--	--
Bromophos-ethyl	NS	--	--	--	--
Butylate	NS	--	--	--	--
Captan	NS	--	--	--	--
Carbophenothion	NS	--	--	--	--
Chlorbenside	NS	--	--	--	--
Chlorfenson (Ovex)	NS	--	--	--	--
Chlorfenvinphos	NS	--	--	--	--
Chlormephos	NS	--	--	--	--
Chlorothalonil	NS	--	--	--	--
Chlorpropham	NS	--	--	--	--
Chlorpyrifos	NS	--	--	--	--
Chlorpyrifos Methyl	NS	--	--	--	--
Chlorthiophos	NS	--	--	--	--
Cyanazine	NS	--	--	--	--
Cyanophos	NS	--	--	--	--
Dacthal	NS	--	--	--	--
d-BHC	NS	<0.0001	<0.0001	<0.0001	<0.0001
Demeton	NS	--	--	--	--
Desethyl Atrazine	NS	--	--	--	--
Desmetryn	NS	--	--	--	--
Diallate	NS	--	--	--	--
Diazinon	NS	--	--	--	--
Dichlobenil	NS	--	--	--	--
Dichlofenthion	NS	--	--	--	--
Dichlofluanid	NS	<0.005	<0.005	<0.005	<0.005
Dichloran	NS	--	--	--	--
Dichlorvos + Naled	NS	--	--	--	--
Dicofol	NS	--	--	--	--
Dicrotophos	NS	--	--	--	--
Dieldrin	0.00285/0.00667	0.00057	<0.0001	<0.0001	<0.0001
Dimethoate	NS	--	--	--	--
Dioxathion	NS	--	--	--	--
Diphenylamine	NS	--	--	--	--
Disulfoton	NS	--	--	--	--
Endosulfan I	NS	<0.0001	<0.0001	<0.0001	<0.0001
Endosulfan II	NS	<0.0001	<0.0001	<0.0001	<0.0001
Endosulfan Sulfate	NS	<0.0001	<0.0001	<0.0001	<0.0001
Endrin	0.00267/0.0624	<0.0001	<0.0001	<0.0001	<0.0001
Endrin Aldehyde	NS	<0.0001	<0.0001	<0.0001	<0.0001
Endrin Ketone	NS	<0.0001	<0.0001	<0.0001	<0.0001
EPN	NS	--	--	--	--
Eptam	NS	--	--	--	--
Ethalfluralin	NS	--	--	--	--
Ethion	NS	--	--	--	--
Fenitrothion	NS	--	--	--	--
Fensulfothion	NS	--	--	--	--
Fenthion	NS	--	--	--	--
Folpet	NS	--	--	--	--
Fonofos	NS	--	--	--	--

TABLE 2

2010 SEDIMENT ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

	Sample Location	*SED-9*	*SED-19*	*SED-20*	*Reference*
	Sample Date	*11/24/10*	*11/24/10*	*11/24/10*	*11/24/10*
	Sample ID:	*Oxley's Pond*	*Pond J*	*Pond K*	*Background Pond*
Parameter	*CCME Interim Sediment Quality Guidelines/ Probable Effects Level*				
g-chlordane	NS	<0.0001	<0.0001	<0.0001	<0.0001
Guthion	NS	--	--	--	--
Heptachlor	0.0006/0.00274	0.00142	<0.0001	0.0007	<0.0001
Heptachlor epoxide	0.0006/0.00274	<0.0001	<0.0001	<0.0001	<0.0001
Hexachlorobenzene	NS	<0.0001	<0.0001	<0.0001	<0.0001
Hexazinone	NS	--	--	--	--
Iodofenphos	NS	--	--	--	--
Iprodione	NS	--	--	--	--
Isofenphos	NS	--	--	--	--
Lindane (gamma - BHC)	NS	<0.0001	<0.0001	<0.0001	<0.0001
Malaoxon	NS	--	--	--	--
Malathion	NS	--	--	--	--
Metalaxyl	NS	--	--	--	--
Methamidophos	NS	--	--	--	--
Methidathion	NS	--	--	--	--
Methoxychlor	NS	<0.0001	<0.0001	<0.0001	<0.0001
Metolachlor	NS	--	--	--	--
Metribuzin	NS	--	--	--	--
Mevinphos	NS	--	--	--	--
Mirex	NS	<0.0001	<0.0001	<0.0001	<0.0001
Nitrofen	NS	--	--	--	--
Omethoate	NS	--	--	--	--
Parathion	NS	--	--	--	--
Parathion Methyl	NS	--	--	--	--
Pentachloronitrobenzene	NS	<0.005	<0.005	<0.005	<0.005
Permethrin	NS	--	--	--	--
Phorate	NS	--	--	--	--
Phosalone	NS	--	--	--	--
Phosmet	NS	--	--	--	--
Phosphamidon	NS	--	--	--	--
Pirimicarb	NS	--	--	--	--
Pirimiphos-ethyl	NS	--	--	--	--
Pirimiphos-methyl	NS	--	--	--	--
Procymidone	NS	--	--	--	--
Profenophos	NS	<0.005	<0.005	<0.005	<0.005
Profluralin	NS	--	--	--	--
Prometryn	NS	--	--	--	--
Pronamide	NS	--	--	--	--
Propazine	NS	<0.005	<0.005	<0.005	<0.005
Propiconazole	NS	--	--	--	--
Pyrazophos	NS	--	--	--	--
Quinalphos	NS	--	--	--	--
Ronnel	NS	--	--	--	--
Simazine	NS	--	--	--	--
Stirophos	NS	--	--	--	--
Sulfotepp	NS	--	--	--	--
Tecnazene	NS	--	--	--	--
Terbufos	NS	--	--	--	--
Terbuthylazine	NS	--	--	--	--
Terbutryne	NS	--	--	--	--
Tetradifon	NS	--	--	--	--
Tolyfluanid	NS	--	--	--	--
Triadimefon	NS	--	--	--	--
Triallate	NS	--	--	--	--
Trifluralin	NS	--	--	--	--
Vinclozolin	NS	--	--	--	--

Notes:

All results and standards in µg/g, unless otherwise noted

--, Not analyzed.

NS, No Standard

Note: Shading indicates sample concentration exceeds guidelines

TABLE 3

SEDIMENT GRAIN SIZE RESULTS

	Sed-9 (Oxley's Pond) Nov 24/10	Sed-19 (Pond J) Nov 24/10	Sed-20 (Pond K) Nov 24/10	Sed-9 (Oxley's Pond) Nov 24/10	Reference (Pond E) Nov 24/10
% Sand	5.6	64.6	3.0	14.3	46.3
% Silt	60.0	32.6	74.4	76.5	41.0
% Clay	34.4	2.7	22.6	9.1	12.7

Organic Carbon (%)	12.1	23.9	5.0	1.9	28.2

TABLE 4

FISH MEASUREMENTS (CRA 2010)

Sample ID#	*Species*	*Date Collected*	*Locality*	*Weight (lbs)*	*Weight (g)*	*Length (mm)*	*Lab Analysis*
Oxley's Pond Fillet Analysis #1	Brook Trout	6-Dec-10	Oxley's Pond	0.6	276.7	280	Fillet analysis completed
Oxley's Pond Fillet Analysis #2	Brook Trout	6-Dec-10	Oxley's Pond	0.5	217.7	260	Fillet analysis completed
Oxley's Pond Fillet Analysis #3	Brook Trout	8-Dec-10	Oxley's Pond	1.6	725.7	390	Fillet analysis completed
Oxley's Pond Fillet Analysis #4	Brook Trout	8-Dec-10	Oxley's Pond	1.1	499.0	350	Fillet analysis completed
Oxley's Pond Fillet Analysis #5	Brook Trout	8-Dec-10	Oxley's Pond	0.4	195.0	270	Fillet analysis completed
Oxley's Pond Whole Fish #6	Brook Trout	1-Dec-10	Oxley's Pond	0.4	167.8	240	Whole Fish analysis completed
Oxley's Pond Fillet #7	Brook Trout	3-Dec-10	Oxley's Pond	0.3	127.0	200	Whole Fish analysis completed
Oxley's Pond Whole Fish #8	Brook Trout	8-Dec-10	Oxley's Pond	0.4	181.4	250	Whole Fish analysis completed
Oxley's Pond Composite Sample #9	Minnow	29-Nov to 8-Dec-10	Oxley's Pond	0.1	38.0	36 fish	Composite sample of 36 minnows
Pond J Fillet Analysis #1	Brook Trout	6-Dec-10	Pond J	0.8	358.3	300	Fillet analysis completed
Pond J Fillet Analysis #2	Brook Trout	6-Dec-10	Pond J	0.5	226.8	275	Fillet analysis completed
Pond J Fillet Analysis #3	Brook Trout	6-Dec-10	Pond J	0.6	258.5	275	Fillet analysis completed
Pond J Fillet Analysis #4	Brook Trout	6-Dec-10	Pond J	0.6	258.5	280	Fillet analysis completed
Pond J Fillet Analysis #5	Brook Trout	6-Dec-10	Pond J	0.4	176.9	255	Fillet analysis completed
Pond J Whole Fish #6	Brook Trout	6-Dec-10	Pond J	0.4	176.9	250	Whole Fish analysis completed
Pond J Whole Fish #7	Brook Trout	6-Dec-10	Pond J	0.4	199.6	255	Whole Fish analysis completed
Pond J Whole Fish #8	Brook Trout	6-Dec-10	Pond J	0.4	176.9	265	Whole Fish analysis completed
Pond J Whole Fish #9	Brook Trout	6-Dec-10	Pond J	0.4	176.9	265	Whole Fish analysis completed
Pond J Composite Sample #10	Minnow	6-Dec to 8-Dec-10	Pond J	0.1	30.0	23 fish	Composite sample of 23 minnows
Pond K Fillet Analysis #1	Brook Trout	3-Dec-10	Pond K	1.0	449.1	325	Fillet analysis completed
Pond K Fillet Analysis #2	Brook Trout	3-Dec-10	Pond K	0.8	367.4	310	Fillet analysis completed
Pond K Fillet Analysis #3	Brook Trout	3-Dec-10	Pond K	0.7	299.4	290	Fillet analysis completed
Pond K Fillet Analysis #4	Brook Trout	3-Dec-10	Pond K	0.7	308.4	300	Fillet analysis completed
Pond K Fillet Analysis #5	Brook Trout	3-Dec-10	Pond K	0.6	267.6	280	Fillet analysis completed
Pond K Whole Fish #6	Brook Trout	3-Dec-10	Pond K	0.3	149.7	240	Whole Fish analysis completed
Pond K Whole Fish #7	Brook Trout	3-Dec-10	Pond K	0.3	127.0	220	Whole Fish analysis completed
Pond K Whole Fish #8	Brook Trout	3-Dec-10	Pond K	0.3	117.9	210	Whole Fish analysis completed
Pond K Whole Fish #9	Brook Trout	3-Dec-10	Pond K	0.2	99.8	220	Whole Fish analysis completed
Pond K Composite Sample #10	Minnow	29-Nov to 8-Dec-10	Pond K	0.1	33.0	26 fish	Composite sample of 26 minnows
Ref Pond Fillet Analysis #1	Brook Trout	1-Dec-10	Pond E	0.7	326.6	300	Fillet analysis completed
Ref Pond Fillet Analysis #2	Brook Trout	1-Dec-10	Pond E	0.8	376.5	300	Fillet analysis completed
Ref Pond Fillet Analysis #3	Brook Trout	1-Dec-10	Pond E	0.4	158.8	250	Fillet analysis completed
Ref Pond Fillet Analysis #4	Brook Trout	1-Dec-10	Pond E	0.4	176.9	250	Fillet analysis completed
Ref Pond Fillet Analysis #5	Brook Trout	1-Dec-10	Pond E	0.4	158.8	250	Fillet analysis completed
Ref Pond Whole Fish #6	Brook Trout	1-Dec-10	Pond E	0.3	136.1	250	Whole Fish analysis completed
Ref Pond Whole Fish #7	Brook Trout	1-Dec-10	Pond E	0.3	136.1	245	Whole Fish analysis completed
Ref Pond Whole Fish #8	Brook Trout	1-Dec-10	Pond E	0.3	136.1	230	Whole Fish analysis completed
Ref Pond Whole Fish #9	Brook Trout	1-Dec-10	Pond E	0.3	136.1	240	Whole Fish analysis completed
Ref Pond Composite Sample #10	Minnow	1-Dec to 10-Dec-10	Pond E	0.1	45.0	35 fish	Composite sample of 35 minnows

TABLE 5

FISH TISSUE ANALYTICAL RESULTS - FILLETS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Sample Location:	*OXLEY'S POND*	*OXLEY'S POND*	*OXLEY'S POND*	*OXLEY'S POND*	*OXLEY'S POND*	*POND J*	*POND J*	*POND J*	*POND J*	*POND J*
Sample No.:	*FILLET ANALYSIS #1*	*FILLET ANALYSIS #2*	*FILLET ANALYSIS #3*	*FILLET ANALYSIS #4*	*FILLET ANALYSIS #5*	*FILLET ANALYSIS #1*	*FILLET ANALYSIS #2*	*FILLET ANALYSIS #3*	*FILLET ANALYSIS #4*	*FILLET ANALYSIS #5*
Sample Date:	*12/8/2010*	*12/8/2010*	*12/8/2010*	*12/8/2010*	*12/8/2010*	*12/6/2010*	*12/6/2010*	*12/6/2010*	*12/6/2010*	*12/6/2010*
Parameter										
2,4′-DDD	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4′-DDE	<0.10	<0.10	<0.10	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4′-DDT	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4′-DDD	<0.10	0.33	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4′-DDE	3.95	0.78	0.54	5.75	1.82	0.29	0.81	0.39	0.33	0.39
4,4′-DDT	0.81	0.3	0.25	0.89	0.45	0.29 ABL	<0.10	<0.10	<0.10	<0.10
Aldrin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
alpha-BHC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
alpha-Chlordane	0.42	<0.10	<0.10	0.45	0.17	<0.10	<0.10	<0.10	<0.10	<0.10
beta-BHC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
delta-BHC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dieldrin	1.37	0.54	0.11	0.81	1.7	0.12	0.11 ABL	0.2	0.16	0.21
Endosulfan I	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan II	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan Sulfate	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Aldehyde	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Ketone	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-BHC (Lindane)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-Chlordane	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor Epoxide	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Hexachlorobenzene	0.44	0.14	<0.10	0.2	0.12	<0.10	<0.10	0.12	0.1	0.1
Methoxychlor	<0.10	0.62	<0.10	0.74	0.46	<0.10	<0.10	<0.10	<0.10	0.35
Mirex	0.1	<0.10	<0.10	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
PCNB	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Profenofos	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Propazine	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Trans-nonachlor	1.12	0.16	<0.10	1.54	1.06	<0.10	0.17	0.14	<0.10	<0.10

Notes:

All results and standards in µg/kg, unless otherwise noted

<0.001, Not detected at associated value.

ABL, Approximate Result: May Be Biased Low

NS, No Standard

TABLE 5

FISH TISSUE ANALYTICAL RESULTS - FILLETS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Sample Location:	*POND K*	*POND K*	*POND K*	*POND K*	*POND K*	*REF POND*	*REF POND*	*REF POND*	*REF POND*	*REF POND*
Sample No.:	*FILLET ANALYSIS #1*	*FILLET ANALYSIS #2*	*FILLET ANALYSIS #3*	*FILLET ANALYSIS #4*	*FILLET ANALYSIS #5*	*FILLET ANALYSIS #1*	*FILLET ANALYSIS #2*	*FILLET ANALYSIS #3*	*FILLET ANALYSIS #4*	*FILLET ANALYSIS #5*
Sample Date:	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*
Parameter										
2,4′-DDD	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4′-DDE	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4′-DDT	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4′-DDD	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4′-DDE	1.04	0.53	0.37	0.27	0.61	0.72	0.66	0.74	0.24	0.41
4,4′-DDT	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Aldrin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
alpha-BHC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
alpha-Chlordane	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
beta-BHC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
delta-BHC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dieldrin	0.25	0.14	0.18	<0.10	0.18	0.16	0.27	<0.10	0.25	0.32
Endosulfan I	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan II	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan Sulfate	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin	0.23	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Aldehyde	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Ketone	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-BHC (Lindane)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-Chlordane	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor Epoxide	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Hexachlorobenzene	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.13
Methoxychlor	<0.10	0.42	0.34	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Mirex	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
PCNB	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Profenofos	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Propazine	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Trans-nonachlor	<0.10	<0.10	0.11	<0.10	0.18	<0.10	0.11	<0.10	<0.10	<0.10

Notes:

All results and standards in µg/kg, unless otherwise noted

<0.001, Not detected at associated value.

ABL, Approximate Result: May Be Biased Low

NS, No Standard

TABLE 6

FISH TISSUE ANALYTICAL RESULTS - WHOLE FISH
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Screening Criteria* [1]	*Sample Location:* OXLEY'S POND	OXLEY'S POND	OXLEY'S POND	OXLEY'S POND	POND J	POND J	POND J	POND J	POND J	POND K	POND K
		Sample No.: WHOLE FISH #6	WHOLE FISH #7	WHOLE FISH #8	COMPOSITE SAMPLE #9	WHOLE FISH #6	WHOLE FISH #7	WHOLE FISH #8	WHOLE FISH #9	COMPOSITE SAMPLE #10	WHOLE FISH #6	WHOLE FISH #7
		Sample Date: 12/8/2010	12/8/2010	12/8/2010	12/8/2010	12/6/2010	12/6/2010	12/6/2010	12/6/2010	12/6/2010	12/3/2010	12/3/2010
2,4'-DDD	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4'-DDE	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4'-DDT	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4'-DDD	NS	<0.10	0.32	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4'-DDE	NS	1.76	10.4	2.42	2.73	0.4	0.47	0.31	0.26	0.45	0.14	0.34
4,4'-DDT	NS	0.74	0.75	0.78	0.88	<0.10	<0.10	<0.10	<0.10	<0.10	0.27	<0.10
Total DDT	14	0.74	0.75	0.78	0.88	<0.10	<0.10	<0.10	<0.10	<0.10	0.27	<0.10
Aldrin	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
alpha-BHC	NS	0.11	<0.10	0.14	0.22	<0.10	<0.10	<0.10	<0.10	0.15	<0.10	<0.10
alpha-Chlordane	NS	<0.10	<0.10	0.51	0.61	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
beta-BHC	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
delta-BHC	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dieldrin	NS	11.1	3.35	5.75	3.16	0.15	0.16	0.21	0.24	0.43	0.1	0.16
Endosulfan I	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan II	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan Sulfate	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin	NS	<0.10	<0.10	<0.10	<0.10	0.11 ABL	<0.10	<0.10	<0.10	0.15	<0.10	<0.10
Endrin Aldehyde	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Ketone	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-BHC (Lindane)	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-Chlordane	NS	<0.10	<0.10	0.1	0.18	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor Epoxide	NS	0.28 ABL	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Hexachlorobenzene	NS	<0.10	<0.10	0.32	0.29	0.14	0.19	<0.10	0.11	0.27	<0.10	<0.10
Methoxychlor	NS	<0.10	<0.10	0.53	<0.10	<0.10	<0.10	0.45	0.47	<0.10	<0.10	<0.10
Mirex	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.12	<0.10	<0.10	<0.10
PCNB	NS	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Profenofos	NS	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Propazine	NS	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Trans-nonachlor	NS	<0.10	0.46	2	0.76	<0.10	0.14 ABL	<0.10	<0.10	0.17	<0.10	<0.10

Notes:

All results and standards in µg/kg, unless otherwise noted

(1) Canadian Council of Ministers of the Environment, Canadian Environmental Quality Guidelines, Tissue Residue Guidelines for the Protection of Wildlife Consumers of Aquatic Biota, 1999, updated 2011.

<0.001, Not detected at associated value.

ABL, Approximate Result: May Be Biased Low

NS, No Standard

TABLE 6

FISH TISSUE ANALYTICAL RESULTS - WHOLE FISH
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

	Sample Location:	*POND K*	*POND K*	*POND K*	*REF POND*	*REF POND*	*REF POND*	*REF POND*	*REF POND*
	Sample No.:	*WHOLE FISH #8*	*WHOLE FISH #9*	*COMPOSITE SAMPLE #10*	*WHOLE FISH #6*	*WHOLE FISH #7*	*WHOLE FISH #8*	*WHOLE FISH #9*	*COMPOSITE SAMPLE #10*
	Sample Date:	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*
Parameter	*Final Screening Criteria* [1,2]								
2,4'-DDD	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4'-DDE	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4'-DDT	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4'-DDD	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4'-DDE	NS	0.25	0.21	0.32	0.21	0.19	0.66	0.2	0.13
4,4'-DDT	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Total DDT	14	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Aldrin	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
alpha-BHC	NS	<0.10	<0.10	0.13	<0.10	<0.10	<0.10	<0.10	0.18
alpha-Chlordane	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
beta-BHC	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
delta-BHC	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dieldrin	NS	0.17	<0.10	0.34	0.23	0.19	0.17	0.35	0.42
Endosulfan I	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan II	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan Sulfate	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.21 ABL	<0.10
Endrin Aldehyde	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Ketone	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-BHC (Lindane)	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-Chlordane	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor Epoxide	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Hexachlorobenzene	NS	<0.10	<0.10	0.24	0.13	<0.10	<0.10	0.12	<0.10
Methoxychlor	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Mirex	NS	<0.10	<0.10	<0.10	0.23	<0.10	<0.10	<0.10	<0.10
PCNB	NS	<20	<20	<20	<20	<20	<20	<20	<20
Profenofos	NS	<20	<20	<20	<20	<20	<20	<20	<20
Propazine	NS	<20	<20	<20	<20	<20	<20	<20	<20
Trans-nonachlor	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

Notes:

All results and standards in µg/kg, unless otherwise noted

(1) Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 2, Risk Assessment and Fish Consumption Limits, Third Edition, EPA 823-B-00-008, November 2000.

<0.001, Not detected at associated value.

ABL, Approximate Result: May Be Biased Low

NS, No Standard

TABLE 7

SEDIMENT TOXICITY TEST RESULTS (10-DAY)
Freshwater Invertebrate Chironomus dilutus

Sample	*Average Survival (%)*	*Average Weight (mg)*	*Particle Size (% Sand)*	*TOC (%)*	*Moisture Content (%)*	*Dieldrin Concentration (mg/kg)*	*Heptachlor Concentration (mg/kg)*	*Total Ammonia (mg/L)*	*Unionized Ammonia (mg/L)*
Sed-9 (Oxley's Pond)	90	1.807	5.6	12.1	90.7	0.00057	0.00142	7.40	0.09
Sed-19 (Pond J)	68	0.317	64.6	23.9	87.3	<0.0001	<0.0001	11.00	0.13
Sed-20 (Pond K)	96	1.306	3	5.01	89.1	<0.0001	0.0007	0.75	0.01
Reference (Pond E)	100	1.696	46.3	28.2	91.1	<0.0001	<0.0001	0.20	0
Control 1 (lab)	98	1.780	0.9	8.9	72	NA	NA	0.20	0.01

Note: NA - Not Available

TABLE 8

SEDIMENT TOXICITY TEST RESULTS (21-DAY)
Freshwater Fish Fry
Fathead Minnow
(Pimephales promelas)

Sample	*Average Survival (%)*	*Particle Size (% Sand)*	*TOC (%)*	*Moisture Content (%)*	*Dieldrin Concentration (mg/kg)*	*Heptachlor Concentration (mg/kg)*	*Total Ammonia (mg/L)*	*Unionized Ammonia (mg/L)*
Sed-9 (Oxley's Pond)	100	5.6	12.1	90.7	0.00057	0.00142	29.00	0.76
Sed-19 (Pond J)	100	64.6	23.9	87.3	<0.0001	<0.0001	23.75	0.25
Sed-20 (Pond K)	95	3	5.01	89.1	<0.0001	0.0007	28.00	0.09
Reference (Pond E)	73	46.3	28.2	91.1	<0.0001	<0.0001	9.60	0.16
Control 1 (lab)	100	0.9	8.9	72	NA	NA	3.35	0.06

Note: NA - Not Available

TABLE 9: BENTHIC DENSITY AND DIVERSITY ANALYSIS
FORMER SALMONIER CORRECTIONAL FACILITY
Benthic Invertebrate Abundance (# / sample) - November 2010

		Reference (Pond E)			Pond J			Pond K			Oxley's Pond		
	Family	1	2	3	1	2	3	1	2	3	1	2	3
EPHEMEROPTERA	no ID - damaged	0	0	0	0	0	2	0	0	0	0	0	0
ODONATA	Coenagrionidae	0	0	0	0	0	0	0	2	0	0	0	0
	Libellulidae	0	0	0	0	0	2	1	0	0	0	0	0
TRICHOPTERA	Hydroptilidae	0	0	0	2	0	0	2	1	2	0	0	0
	Leptoceridae	0	0	0	0	0	0	1	0	0	0	0	0
	Limnephilidae	0	0	0	0	2	0	0	0	0	0	0	0
NEUROPTERA	Sisyridae	0	0	0	0	0	0	0	2	0	0	0	0
DIPTERA	Ceratopogonidae	2	4	0	16	18	42	1	4	0	0	0	1
	Chaoboridae	0	0	0	0	0	0	0	0	0	1	0	2
	Chironomidae	88	68	100	80	48	86	94	80	32	1	3	1
	Empididae	0	0	0	2	0	0	0	0	0	0	0	0
	Tabanidae	1	0	0	0	0	0	0	0	0	0	0	0
	Tipulidae	0	0	0	2	0	2	0	0	0	0	0	0
NEMERTEA		0	4	2	2	2	0	2	1	0	0	0	0
OLIGOCHAETA	Enchytraeidae	3	2	4	8	12	16	2	0	1	0	0	0
	Lumbriculicidae	1	0	0	2	10	8	0	1	0	0	0	0
	Naididae	43	24	20	2	2	6	15	10	6	0	0	0
	Tubificidae	41	16	10	12	8	12	0	3	0	0	1	0
HIRUDINEA	Glossiphoniidae	0	2	0	0	0	0	0	0	0	0	0	0
GASTROPODA	Hydrobidae	1	0	0	0	0	0	0	1	3	0	0	0
	Lymnaeidae	0	0	0	2	0	0	0	0	0	0	0	0
	Planorbidae	0	0	0	2	4	0	0	0	0	0	0	0
	no ID - damaged	0	0	0	0	4	0	0	0	0	0	0	0
BIVALVIA	Sphaeriidae	12	6	14	14	6	16	2	2	0	0	0	0
HYDRACARINA		3	2	2	0	0	0	2	0	0	0	0	0
AMPHIPODA	Gammaridae	0	0	0	2	0	4	0	0	0	0	0	0
	Hyalellidae	1	0	0	4	0	4	10	15	6	0	0	0
	Total # of individuals	196	128	152	152	116	200	132	122	50	2	4	4
	Number of taxa	11	9	7	15	11	12	11	12	6	2	2	3

Taxa not usually included in freshwater benthic invertebrate analysis :

NEMATODA		7	8	10	116	188	236	5	16	6	2	1	1
TUBELLARIA		0	0	0	0	0	0	2	0	1	0	0	0
HARPACTICOIDA		83	68	104	24	6	30	0	0	0	0	0	0
OSTRACODA		31	12	10	0	2	2	0	0	0	0	0	0

SHANNON-WEAVER DIVERSITY INDEX	1.47	1.46	1.15	1.76	1.88	1.79	1.11	1.30	1.17	0.69	0.56	1.04

APPENDIX A

SITE PHOTOGRAPHS

LEGEND:

APPROX. PROPERTY BOUNDARY

A POND IDENTIFICATION

PHOTO LOCATION AND ORIENTATION

figure A1

SITE PLAN WITH PHOTOGRAPH LOCATIONS
HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
Salmonier, Newfoundland and Labrador

072004 GN-NL0A1

Photo 1: View, looking northwest, towards the former agriculture fields adjacent to Oxley's pond.

Photo 2: View, looking west, towards the former agriculture fields adjacent to Little Gull Pond. A previously installed monitoring well (MW4) is visible along the base of the field.

Photo 3: View, looking east, towards Pond E as the water flows west towards Little Gull Pond.

Photo 4: View, looking west, towards a small wetland as the water flows from Pond E towards Little Gull Pond.

Photo 5: View, looking northwest, towards Oxley's Pond. Note the water is flowing south towards Little Gull Pond.

Photo 6: View, looking northwest, towards Oxley's Pond and former agricultural fields to the west.

Photo 7: View, looking east, towards Oxley's Pond prior to sampling. Note the former agriculture fields in the background.

Photo 8: View, looking north, towards a gill net set out in Oxley's Pond during sampling activities.

Photo 9: Representative fish captured from Oxley's Pond and submitted for laboratory analysis.

Photo 10: Typical minnow trap and minnows captured from Oxley's Pond during sampling activities.

Photo 11: View, looking north, toward Pond J during sampling activities.

Photo 12: View, looking west, towards Pond J. Note the minnow trap buoys in the foreground.

Photo 13: **View, looking west in Pond J during fishing activities.**

Photo 14: **Representative fish captured from Pond J and submitted for laboratory analysis.**

Photo 15: View, looking southwest towards Pond K.

Photo 16: View, looking south towards Pond K.

Photo 17: **View, looking southwest, towards a gill net set out in Pond K.**

Photo 18: **Representative fish captured from Pond K and submitted for laboratory analysis.**

Photo 19: View, looking south within Pond E.

Photo 20: View, looking southeast, towards Pond E. Note the minnow trap to the left of the photo.

Photo 21: View, looking east, towards Pond E. Note the beaver house in the background of the photo.

APPENDIX B

HISTORICAL DATA TABLES

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Initial Screening Criteria* [1,2,3,4]	*Sample Location*	*TP1-SS1*	*TP1-SS2*	*TP2-SS2*	*TP2-SS2*	*TP3-SS1*	*TP3-SS2*	*TP4-SS1*	*TP4-SS2*	*TP5-SS1*	*TP5-SS2*	*TP6-SS1*	*TP7-SS1*	*TP7-SS4*	*TP8-SS1*	*TP8-SS2*	*TP9-SS1*	*TP9-SS3*	*EX1-SS1*	*EX1-SS2*	*EX1-SS3*	*EX1-SS4*	*EX2-SS1*	*EX2-SS2*	*EX2-SS3*
		Sample Date	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*
		Sample ID:	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Sample Depth (mbgs)	*0-1m*	*0.3-1.1m*	*1-2m*	*1.1-1.9m*	*0-1m*	*1-1.6m*	*0-1.1m*	*1.1-1.4m*	*0-1m*	*1-1.7m*	*0-1m*	*0-0.9m*	*2.8-3.5m*	*0-1m*	*1-2m*	*0-1.1m*	*1.9-2.4m*	*1-2m*	*1.3-2.1m*	*1.2-2.1m*	*1.2-2.1m*	*1-1.9m*	*1.4-1.9m*	*1.9-2.1m*
Benzene	0.16		<0.025	<0.025	<0.025	<0.025	<0.025/<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.082	<0.025	<0.025	<0.025	<0.025
Toluene	14		<0.025	<0.025	<0.025	<0.025	<0.025/<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.657	<0.025	<0.025	<0.025	<0.025
Ethylbenzene	58		<0.025	<0.025	<0.025	<0.025	<0.025/<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	0.975	<0.025	0.81	<0.025	<0.025	<0.025	0.19
Xylenes (total)	17		<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1.69	<0.05	9.39	<0.05	<0.05	<0.05	0.525
TPH (C6-C10)	--		5.1	<2.5	<2.5	<2.5	<2.5/<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	75	3.1	490	<2.5	<2.5	<2.5	36
TPH (C10-C21)	--		1400	71	<15	<15	250/230	25	<15	<15	<15	<15	54	<15	<15	<15	<15	30	<15	970	73	3800	<15	<15	<15	1000
TPH (C21-C32)	--		240	31	<15	<15	190/170	29	<15	<15	<15	<15	67	<15	<15	<15	<15	33	<15	45	<15	130	<15	<15	<15	120
Modified TPH	--		1645	100	<32	<32	440/410	54	<32	<32	<32	<32	120	<32	<32	<32	<32	63	<32	1100	76	4400	<32	<32	<32	1200
Modified TPH (gas source)	39		--	--	<32	<32	--	--	<32	<32	<32	<32	--	<32	<32	<32	<32	--	<32	--	--	--	<32	<32	<32	--
Modified TPH (fuel oil source)	140		1600	100	<32	<32	--	--	<32	<32	<32	<32	--	<32	<32	<32	<32	--	<32	1100	76	4400	<32	<32	<32	1200
Modified TPH (lube oil source)	690		--	--	<32	<32	440/410	54	<32	<32	<32	<32	120	<32	<32	<32	<32	63	<32	--	--	--	<32	<32	<32	--
2,4'-DDD	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4'-DDE	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4'-DDT + 4,4'-DDD	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	23		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	23		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-methoxychlor	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
a-BHC	0.77		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acephate	560		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
a-Chlordane	5.9		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Alachlor	87		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aldrin	0.56		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aspon	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Atrazine	21		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Azinophos methyl (Guthion)	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Azinphos ethyl	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
b-BHC	2.7		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benfluralin	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromacil	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromophos	62		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromophos-ethyl	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butylate	620		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Captan	2,100		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbophenothion	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorbenside	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorfenson(ovex)	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorfenvinphos(e/z)	8.6		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlormephos	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorothalonil (Daconil)	1,600		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorpropham	2,400		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorpyrifos	36		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorpyriphos-methyl	122		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorthiophos	9.8		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanazine (Bladex)	5.8		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cyanophos	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dacthal	122		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
d-BHC	2.7		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Demeton	0.48		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Desethyl-atrazine	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Desmetryn	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diallate(e/z)	80		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diazinon	8.6		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlofenthion	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlofluanid	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichloran	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlorvos + Naled	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Initial Screening Criteria* [1,2,3,4]	*Sample Location*	*TP1-SS1*	*TP1-SS2*	*TP2-SS2*	*TP2-SS2*	*TP3-SS1*	*TP3-SS2*	*TP4-SS1*	*TP4-SS2*	*TP5-SS1*	*TP5-SS2*	*TP6-SS1*	*TP7-SS1*	*TP7-SS4*	*TP8-SS1*	*TP8-SS2*	*TP9-SS1*	*TP9-SS3*	*EX1-SS1*	*EX1-SS2*	*EX1-SS3*	*EX1-SS4*	*EX2-SS1*	*EX2-SS2*	*EX2-SS3*
		Sample Date	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*
		Sample ID:	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*
		Sample Depth (mbgs)	*0-1m*	*0.3-1.1m*	*1-2m*	*1.1-1.9m*	*0-1m*	*1-1.6m*	*0-1.1m*	*1.1-1.4m*	*0-1m*	*1-1.7m*	*0-1m*	*0-0.9m*	*2.8-3.5m*	*0-1m*	*1-2m*	*0-1.1m*	*1.9-2.4m*	*1-2m*	*1.3-2.1m*	*1.2-2.1m*	*1.2-2.1m*	*1-1.9m*	*1.4-1.9m*	*1.9-2.1m*
Dicofol	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dicrotophos	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	0.94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethoate	2.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxathion	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diphenylamine	300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Disulfoton (Di-Syston)	0.48	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan I	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan II	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endosulfan Sulfate	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin	4.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin Aldehyde	4.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Endrin ketone	4.7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
EPN	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Eptam	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethalfluralin	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethion	6.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fenitrothion	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fensulfothion	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fenthion	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Folpet	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fonofos	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
g-Chlordane	5.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor epoxide	1.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	2.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexazinone	400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iodofenphos	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iprodione	480	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Isofenphos	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lindane (BHC), gamma-	0.25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Malaoxon	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Malathion	240	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metalaxyl	740	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methamidophos	0.62	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methidathion	12.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metolachlor	1,840	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metribuzin (Sencor)	300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mevinphos (Phosdrin)	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mirex	0.27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrofen	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Omethoate	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Parathion	74	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Parathion methyl	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachloronitrobenzene	19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Permethrin	620	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phorate (Thimet)	2.4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phosalone	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phosmet	240	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phosphamidon	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pirimicarb	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pirimiphos-ethyl	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pirimiphos-methyl	122	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Procymidone	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Profenophos	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Profluralin	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Prometryn	48	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pronamide	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propazine	240	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Propiconazole	158	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pyrazophos	NS	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Initial Screening Criteria* [1,2,3,4]	*Sample Location*	*TP1-SS1*	*TP1-SS2*	*TP2-SS2*	*TP2-SS2*	*TP3-SS1*	*TP3-SS2*	*TP4-SS1*	*TP4-SS2*	*TP5-SS1*	*TP5-SS2*	*TP6-SS1*	*TP7-SS1*	*TP7-SS4*	*TP8-SS1*	*TP8-SS2*	*TP9-SS1*	*TP9-SS3*	*EX1-SS1*	*EX1-SS2*	*EX1-SS3*	*EX1-SS4*	*EX2-SS1*	*EX2-SS2*	*EX2-SS3*
		Sample Date	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/30/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*
		Sample ID:	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Sample Depth (mbgs):	*0-1m*	*0.3-1.1m*	*1-2m*	*1.1-1.9m*	*0-1m*	*1-1.6m*	*0-1.1m*	*1.1-1.4m*	*0-1m*	*1-1.7m*	*0-1m*	*0-0.9m*	*2.8-3.5m*	*0-1m*	*1-2m*	*0-1.1m*	*1.9-2.4m*	*1-2m*	*1.3-2.1m*	*1.2-2.1m*	*1.2-2.1m*	*1-1.9m*	*1.4-1.9m*	*1.9-2.1m*
Quinalophos	6.2		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ronnel	620		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Simazine	40		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Stirophos	200		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfotepp	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tecnazene	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Terbufos	0.3		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Terbuthylazine	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Terbutryne	12.2		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetradifon	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tolylfluanid	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Triadimefon	NS		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Triallate	158		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trifluralin	630		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinclozolin	300		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

All results and standards in µg/g, unless otherwise noted

(1) Atlantic Risk Based Corrective Action (RBCA) User Guidance for Petroleum Impacted Sites in Atlantic Canada, Version 2.0, Tier I Risk Based Screening Levels (RBSLs) for Soil: Residential, Non-Potable Groundwater, Coarse-Grained Soil.

(2) Canadian Environmental Quality Guidelines: Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Update 7.1, December 2007) - Residential Land Use, Human Health Guidelines, Soil Ingestion/Direct Contact.

(3) MOE Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009.
Appendix A2, Soil Components for Table 3 - Full Depth , Potable Water Scenario, Coarse Textured Soils, Residential/Parkland Land Use - Lower of S1 risk (soil contact), S-GW1 (soil leaching), S-IA (indoor air), Indoor Air Odour, and Outdoor Air, where available.
The MOE screening criterion are based on a 10-6 risk level for carcinogens and a hazard index of 0.2 for non-carcinogens. To be consistent with the target risk level of 10-5, the MOE criteria for carcinogens based on a risk of 10-6 were multipied by a factor of 10.

(4) Due to lack of screening criterion available, residential soil screening level taken from Regional Screening Levels (RSLs) table, November 2010.
The RSLs criteria are based on a 10^{-6} risk level for carcinogens and a hazard index of 1 for non-carcinogens. To be consistent with the
target risk and hazard levels of 10^{-5} and 0.2, the RSLs criteria for carcinogens were multiplied by 10 and for non-carcinogens were divided by a factor of 5.

<0.01/<0.01 - Parent/Duplicate Sample
<0.02, Not detected at associated value.
--, Not analyzed.
NS, No Standard
mbgs, metres below ground surface
Concentration above the Final Screening Criteria

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Final Screening Criteria* [1,2,3,4]	*Sample Location*	*EX2-SS4*	*EX2-SS5*	*SS1*	*SS2*	*SS3*	*SS4*	*SS5*	*SS6*	*SS-1*	*SS-2*	*SS-3*	*SS-4*	*SS-5*	*SS-6*	*SS-7*	*SS-8*	*SS-9*	*SS-10*	*SS-11*	*SS-12*	*SS-13*	*SS-14*	*SS-15*
		Sample Date	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/23/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/23/09*	*03/24/09*	*03/24/09*	*03/23/09*
		Sample ID:	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*O24739*	*O24740*	*O24741*	*O24742*	*O24743*	*O24744*	*O24745*	*O24746*	*O24747*	*O24748*	*O24749*	*O24750*	*O24751*	*O24752*	*O24753*
		Sample Depth (mbgs)	*1-1.9m*	*1-1.9m*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*
Benzene	0.16		<0.025	<0.025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	14		<0.025	<0.025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	58		0.242	<0.025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylenes (total)	17		0.0502	<0.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C6-C10)	--		38	<2.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C10-C21)	--		3400	70	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C21-C32)	--		480	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH	--		3900	93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (gas source)	39		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (fuel oil source)	140		3900	93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (lube oil source)	690		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4'-DDD	NS		--	--	--	--	--	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4'-DDE	NS		--	--	--	--	--	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4'-DDT + 4,4'-DDD	NS		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4,4'-DDE	23		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	23		--	--	--	--	--	--	--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
4,4'-methoxychlor	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
a-BHC	0.77		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acephate	560		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
a-Chlordane	5.9		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Alachlor	87		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	0.56		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aspon	NS		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Atrazine	21		--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Azinophos methyl (Guthion)	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Azinphos ethyl	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
b-BHC	2.7		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benfluralin	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bromacil	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bromophos	62		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromophos-ethyl	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Butylate	620		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Captan	2,100		--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carbophenothion	NS		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorbenside	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorfenson(ovex)	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chlorfenvinphos(e/z)	8.6		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlormephos	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorothalonil (Daconil)	1,600		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chlorpropham	2,400		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chlorpyrifos	36		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorpyriphos-methyl	122		--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Chlorthiophos	9.8		--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cyanazine (Bladex)	5.8		--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cyanophos	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dacthal	122		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
d-BHC	2.7		--	--	--	--	--	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Demeton	0.48		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Desethyl-atrazine	NS		--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Desmetryn	NS		--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Diallate(e/z)	80		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Diazinon	8.6		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dichlobenil	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dichlofenthion	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dichlofluanid	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dichloran	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dichlorvos + Naled	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Final Screening Criteria* [1,2,3,4]	*Sample Location*	*EX2-SS4*	*EX2-SS5*	*SS1*	*SS2*	*SS3*	*SS4*	*SS5*	*SS6*	*SS-1*	*SS-2*	*SS-3*	*SS-4*	*SS-5*	*SS-6*	*SS-7*	*SS-8*	*SS-9*	*SS-10*	*SS-11*	*SS-12*	*SS-13*	*SS-14*	*SS-15*
		Sample Date	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*06/29/04*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/23/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/23/09*	*03/24/09*	*03/24/09*	*03/23/09*
		Sample ID:	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*O24739*	*O24740*	*O24741*	*O24742*	*O24743*	*O24744*	*O24745*	*O24746*	*O24747*	*O24748*	*O24749*	*O24750*	*O24751*	*O24752*	*O24753*
		Sample Depth (mbgs)	*1-1.9m*	*1-1.9m*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*
Dicofol	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dicrotophos	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.94		--	--	1.7	4.5	0.26	2	1.3	0.67	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.17
Dimethoate	2.4		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dioxathion	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Diphenylamine	300		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Disulfoton (Di-Syston)	0.48		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Endosulfan I	38		--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	38		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Endosulfan Sulfate	38		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	4.7		--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	4.7		--	--	--	--	--	--	--	--	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Endrin ketone	4.7		--	--	--	--	--	--	--	--	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
EPN	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Eptam	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethalfluralin	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethion	6.2		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fenitrothion	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fensulfothion	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fenthion	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Folpet	1,400		--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fonofos	24		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
g-Chlordane	5.9		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	1.5		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Heptachlor epoxide	1.1		--	--	--	--	--	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	2.9		--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Hexazinone	400		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iodofenphos	NS		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iprodione	480		--	--	--	--	--	--	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Isofenphos	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Lindane (BHC), gamma-	0.25		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Malaoxon	NS		--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	240		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Metalaxyl	740		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Methamidophos	0.62		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methidathion	12.2		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Metolachlor	1,840		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Metribuzin (Sencor)	300		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mevinphos (Phosdrin)	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mirex	0.27		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrofen	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Omethoate	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion	74		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion methyl	3		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pentachloronitrobenzene	19		--	--	--	--	--	--	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Permethrin	620		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phorate (Thimet)	2.4		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Phosalone	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phosmet	240		--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phosphamidon	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Pirimicarb	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Pirimiphos-ethyl	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pirimiphos-methyl	122		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Procymidone	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Profenophos	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Profluralin	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Prometryn	48		--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Pronamide	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Propazine	240		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Propiconazole	158		--	--	--	--	--	--	--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pyrazophos	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	Final Screening Criteria [1,2,3,4]	Sample Location	EX2-SS4	EX2-SS5	SS1	SS2	SS3	SS4	SS5	SS6	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12	SS-13	SS-14	SS-15
		Sample Date	06/29/04	06/29/04	06/29/04	06/29/04	06/29/04	06/29/04	06/29/04	06/29/04	03/24/09	03/24/09	03/24/09	03/24/09	03/23/09	03/24/09	03/24/09	03/24/09	03/24/09	03/24/09	03/24/09	03/23/09	03/24/09	03/24/09	03/23/09
		Sample ID:	--	--	--	--	--	--	--	--	O24739	O24740	O24741	O24742	O24743	O24744	O24745	O24746	O24747	O24748	O24749	O24750	O24751	O24752	O24753
		Sample Depth (mbgs)	1-1.9m	1-1.9m	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Quinalophos	6.2		--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Ronnel	620		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Simazine	40		--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Stirophos	200		--	--	--	--	--	--	--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Sulfotepp	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tecnazene	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Terbufos	0.3		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Terbuthylazine	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Terbutryne	12.2		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tetradifon	NS		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tolylfluanid	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Triadimefon	NS		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Triallate	158		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Trifluralin	630		--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Vinclozolin	300		--	--	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

Notes:

All results and standards in µg/g, unless otherwise noted

(1) Atlantic Risk Based Corrective Action (RBCA) User Guidance for Petroleum Impacted Sites in Atlantic Canada, Version 2.0, Tier I Risk Based Screening Levels (RBSLs) for Soil: Residential, Non-Potable Groundwater, Coarse-Grained Soil.

(2) Canadian Environmental Quality Guidelines: Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Update 7.1, December 2007) - Residential Land Use, Human Health Guidelines, Soil Ingestion/Direct Contact.

(3) MOE Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009.
Appendix A2, Soil Components for Table 3 - Full Depth , Potable Water Scenario, Coarse Textured Soils, Residential/Parkland Land Use - Lower of S1 risk (soil contact), S-GW1 (soil leaching), S-IA (indoor air), Indoor Air Odour, and Outdoor Air, where available.
The MOE screening criterion are based on a 10-6 risk level for carcinogens and a hazard index of 0.2 for non-carcinogens. To be consistent with the target risk level of 10-5, the MOE criteria for carcinogens based on a risk of 10-6 were multipied by a factor of 10.

(4) Due to lack of screening criterion available, residential soil screening level taken from Regional Screening Levels (RSLs) table, November 2010.
The RSLs criteria are based on a 10^{-6} risk level for carcinogens and a hazard index of 1 for non-carcinogens. To be consistent with the
target risk and hazard levels of 10^{-5} and 0.2, the RSLs criteria for carcinogens were multiplied by 10 and for non-carcinogens were divided by a factor of 5.

<0.01/<0.01 - Parent/Duplicate Sample
<0.02, Not detected at associated value.
--, Not analyzed.
NS, No Standard
mbgs, metres below ground surface
Concentration above the Final Screening Criteria

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Final Screening Criteria* [1,2,3,4]	*Sample Location*	*SS-16*	*SS-17*	*SS-18*	*SS-19*	*SS-20*	*SS-21*	*SS-22*	*SS-23*	*SS-24*	*SS-25*	*SS-26*	*SS-27*	*SS-28*	*SS-29*	*SS-30*	*SS-31*	*SS-32*	*SS-33*	*SS-34*	*TP-1A*	*TP-1B*	*TP-2A*	*TP-2B*
		Sample Date	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/24/09*	*03/23/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/23/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*
		Sample ID:	*O24754*	*O24755*	*O24756*	*O24757*	*O24758*	*O24759*	*O24760*	*O24765*	*O24766*	*O24767*	*O24768*	*O24769*	*O24770*	*O24771*	*O24772*	*O24773*	*O24774*	*O24775*	*O24767*	*O24685*	*O24686*	*O24687*	*O24688*
		Sample Depth (mbgs)	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*0.3 mbgs*	*3 mbgs*	*0.3 mbgs*	*3 mbgs*
Benzene	0.16		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	14		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	58		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylenes (total)	17		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C6-C10)	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C10-C21)	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C21-C32)	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (gas source)	39		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (fuel oil source)	140		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (lube oil source)	690		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4'-DDD	NS		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4'-DDE	NS		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4'-DDT + 4,4'-DDD	NS		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4,4'-DDE	23		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	23		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
4,4'-methoxychlor	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
a-BHC	0.77		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acephate	560		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
a-Chlordane	5.9		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Alachlor	87		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	0.56		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aspon	NS		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Atrazine	21		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Azinophos methyl (Guthion)	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Azinphos ethyl	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
b-BHC	2.7		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benfluralin	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bromacil	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Bromophos	62		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bromophos-ethyl	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Butylate	620		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Captan	2,100		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Carbophenothion	NS		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorbenside	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorfenson(ovex)	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chlorfenvinphos(e/z)	8.6		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlormephos	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorothalonil (Daconil)	1,600		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chlorpropham	2,400		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chlorpyrifos	36		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorpyriphos-methyl	122		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Chlorthiophos	9.8		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cyanazine (Bladex)	5.8		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Cyanophos	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dacthal	122		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
d-BHC	2.7		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Demeton	0.48		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Desethyl-atrazine	NS		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Desmetryn	NS		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Diallate(e/z)	80		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Diazinon	8.6		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dichlobenil	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dichlofenthion	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dichlofluanid	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dichloran	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dichlorvos + Naled	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Final Screening Criteria* [1,2,3,4]	*SS-16*	*SS-17*	*SS-18*	*SS-19*	*SS-20*	*SS-21*	*SS-22*	*SS-23*	*SS-24*	*SS-25*	*SS-26*	*SS-27*	*SS-28*	*SS-29*	*SS-30*	*SS-31*	*SS-32*	*SS-33*	*SS-34*	*TP-1A*	*TP-1B*	*TP-2A*	*TP-2B*
Sample Location																								
Sample Date		*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/24/09*	*03/23/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/23/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*
Sample ID:		*O24754*	*O24755*	*O24756*	*O24757*	*O24758*	*O24759*	*O24760*	*O24765*	*O24766*	*O24767*	*O24768*	*O24769*	*O24770*	*O24771*	*O24772*	*O24773*	*O24774*	*O24775*	*O24767*	*O24685*	*O24686*	*O24687*	*O24688*
Sample Depth (mbgs)		*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*0.3 mbgs*	*3 mbgs*	*0.3 mbgs*	*3 mbgs*
Dicofol	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dicrotophos	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.94	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dimethoate	2.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dioxathion	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Diphenylamine	300	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Disulfoton (Di-Syston)	0.48	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Endosulfan I	38	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	38	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Endosulfan Sulfate	38	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Endrin	4.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	4.7	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Endrin ketone	4.7	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
EPN	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Eptam	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethalfluralin	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ethion	6.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fenitrothion	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fensulfothion	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Fenthion	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Folpet	1,400	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fonofos	24	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
g-Chlordane	5.9	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor	1.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Heptachlor epoxide	1.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	2.9	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Hexazinone	400	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iodofenphos	NS	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iprodione	480	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Isofenphos	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Lindane (BHC), gamma-	0.25	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Malaoxon	NS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	240	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Metalaxyl	740	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Methamidophos	0.62	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methidathion	12.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Metolachlor	1,840	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Metribuzin (Sencor)	300	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mevinphos (Phosdrin)	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mirex	0.27	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Nitrofen	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Omethoate	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion	74	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Parathion methyl	3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pentachloronitrobenzene	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Permethrin	620	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phorate (Thimet)	2.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Phosalone	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phosmet	240	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phosphamidon	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Pirimicarb	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Pirimiphos-ethyl	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pirimiphos-methyl	122	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Procymidone	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Profenophos	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Profluralin	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Prometryn	48	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Pronamide	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Propazine	240	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Propiconazole	158	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Pyrazophos	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Final Screening Criteria* [1,2,3,4]	*Sample Location*	*SS-16*	*SS-17*	*SS-18*	*SS-19*	*SS-20*	*SS-21*	*SS-22*	*SS-23*	*SS-24*	*SS-25*	*SS-26*	*SS-27*	*SS-28*	*SS-29*	*SS-30*	*SS-31*	*SS-32*	*SS-33*	*SS-34*	*TP-1A*	*TP-1B*	*TP-2A*	*TP-2B*
		Sample Date	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/24/09*	*03/23/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/23/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*
		Sample ID:	*O24754*	*O24755*	*O24756*	*O24757*	*O24758*	*O24759*	*O24760*	*O24765*	*O24766*	*O24767*	*O24768*	*O24769*	*O24770*	*O24771*	*O24772*	*O24773*	*O24774*	*O24775*	*O24767*	*O24685*	*O24686*	*O24687*	*O24688*
		Sample Depth (mbgs)	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*--*	*0.3 mbgs*	*3 mbgs*	*0.3 mbgs*	*3 mbgs*
Quinalophos	6.2		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Ronnel	620		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Simazine	40		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Stirophos	200		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Sulfotepp	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tecnazene	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Terbufos	0.3		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Terbuthylazine	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Terbutryne	12.2		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tetradifon	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Tolylfluanid	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Triadimefon	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Triallate	158		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Trifluralin	630		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Vinclozolin	300		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02

Notes:

All results and standards in µg/g, unless otherwise noted

(1) Atlantic Risk Based Corrective Action (RBCA) User Guidance for Petroleum Impacted Sites in Atlantic Canada, Version 2.0, Tier I Risk Based Screening Levels (RBSLs) for Soil: Residential, Non-Potable Groundwater, Coarse-Grained Soil.

(2) Canadian Environmental Quality Guidelines: Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Update 7.1, December 2007) - Residential Land Use, Human Health Guidelines, Soil Ingestion/Direct Contact.

(3) MOE Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009.

Appendix A2, Soil Components for Table 3 - Full Depth , Potable Water Scenario, Coarse Textured Soils, Residential/Parkland Land Use - Lower of S1 risk (soil contact), S-GW1 (soil leaching), S-IA (indoor air), Indoor Air Odour, and Outdoor Air, where available.

The MOE screening criterion are based on a 10-6 risk level for carcinogens and a hazard index of 0.2 for non-carcinogens. To be consistent with the target risk level of 10-5, the MOE criteria for carcinogens based on a risk of 10-6 were multipied by a factor of 10.

(4) Due to lack of screening criterion available, residential soil screening level taken from Regional Screening Levels (RSLs) table, November 2010.

The RSLs criteria are based on a 10^{-6} risk level for carcinogens and a hazard index of 1 for non-carcinogens. To be consistent with the

target risk and hazard levels of 10^{-5} and 0.2, the RSLs criteria for carcinogens were multiplied by 10 and for non-carcinogens were divided by a factor of 5.

<0.01/<0.01 - Parent/Duplicate Sample

<0.02, Not detected at associated value.

--, Not analyzed.

NS, No Standard

mbgs, metres below ground surface

Concentration above the Final Screening Criteria

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Final Screening Criteria* [1,2,3,4]	*Sample Location*	*TP-3A*	*TP-3B*	*TP-4A*	*TP-4B*	*TP-5A*	*TP-5B*	*TP-6A*	*TP-6B*	*TP-7A*	*TP-7B*	*TP-8A*	*TP-8B*	*TP-9A*	*TP-9B*	*TP-10A*	*TP-10B*	*TP-11A*	*TP-11B*	*TP-12A*	*TP-12B*	*TP-13A*	*TP-13B*
		Sample Date	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/23/09*	*03/23/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/23/09*	*03/23/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*
		Sample ID:	*O24689*	*O24690*	*O24691*	*O24692*	*O24693*	*O24694*	*O24695*	*O24697*	*O24698*	*O24699*	*O24700*	*O24701*	*O24702*	*O24703*	*O24704*	*O24705*	*O24706*	*O24707*	*O24708*	*O24709*	*O24710*	*O24711*
		Sample Depth (mbgs)	*0.3 mbgs*	*2.4 mbgs*	*0.3 mbgs*	*3 mbgs*	*0.3 mbgs*	*1.8 mbgs*	*0.3 mbgs*	*2.6 mbgs*	*0.3 mbgs*	*3 mbgs*	*0.3 mbgs*	*2.7 mbgs*	*0.3 mbgs*	*3.4 mbgs*	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*2.7 mbgs*	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*2.1 mbgs*
Benzene	0.16		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	14		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	58		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylenes (total)	17		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C6-C10)	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C10-C21)	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C21-C32)	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (gas source)	39		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (fuel oil source)	140		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (lube oil source)	690		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4'-DDD	NS		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
2,4'-DDE	NS		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
2,4'-DDT + 4,4'-DDD	NS		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
4,4'-DDE	23		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
4,4'-DDT	23		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
4,4'-methoxychlor	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
a-BHC	0.77		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Acephate	560		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
a-Chlordane	5.9		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Alachlor	87		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Aldrin	0.56		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Aspon	NS		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Atrazine	21		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Azinophos methyl (Guthion)	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Azinphos ethyl	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
b-BHC	2.7		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Benfluralin	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Bromacil	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Bromophos	62		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Bromophos-ethyl	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Butylate	620		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Captan	2,100		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1/<0.1	<0.1
Carbophenothion	NS		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Chlorbenside	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Chlorfenson(ovex)	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Chlorfenvinphos(e/z)	8.6		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Chlormephos	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Chlorothalonil (Daconil)	1,600		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Chlorpropham	2,400		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Chlorpyrifos	36		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Chlorpyriphos-methyl	122		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Chlorthiophos	9.8		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Cyanazine (Bladex)	5.8		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Cyanophos	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Dacthal	122		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
d-BHC	2.7		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Demeton	0.48		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Desethyl-atrazine	NS		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Desmetryn	NS		<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Diallate(e/z)	80		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Diazinon	8.6		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Dichlobenil	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Dichlofenthion	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Dichlofluanid	NS		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Dichloran	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Dichlorvos + Naled	NS		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Final Screening Criteria* [1,2,3,4]	*TP-3A*	*TP-3B*	*TP-4A*	*TP-4B*	*TP-5A*	*TP-5B*	*TP-6A*	*TP-6B*	*TP-7A*	*TP-7B*	*TP-8A*	*TP-8B*	*TP-9A*	*TP-9B*	*TP-10A*	*TP-10B*	*TP-11A*	*TP-11B*	*TP-12A*	*TP-12B*	*TP-13A*	*TP-13B*
Sample Location																							
Sample Date		*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/23/09*	*03/23/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/23/09*	*03/23/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/20/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*
Sample ID:		*O24689*	*O24690*	*O24691*	*O24692*	*O24693*	*O24694*	*O24695*	*O24697*	*O24698*	*O24699*	*O24700*	*O24701*	*O24702*	*O24703*	*O24704*	*O24705*	*O24706*	*O24707*	*O24708*	*O24709*	*O24710*	*O24711*
Sample Depth (mbgs)		*0.3 mbgs*	*2.4 mbgs*	*0.3 mbgs*	*3 mbgs*	*0.3 mbgs*	*1.8 mbgs*	*0.3 mbgs*	*2.6 mbgs*	*0.3 mbgs*	*3 mbgs*	*0.3 mbgs*	*2.7 mbgs*	*0.3 mbgs*	*3.4 mbgs*	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*2.7 mbgs*	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*2.1 mbgs*
Dicofol	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Dicrotophos	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Dieldrin	0.94	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	0.06	<0.02	0.22	<0.02	1	<0.02	0.02	<0.02	0.2/0.13	<0.02	<0.02/<0.02	<0.02
Dimethoate	2.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Dioxathion	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Diphenylamine	300	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Disulfoton (Di-Syston)	0.48	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Endosulfan I	38	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1/<0.1	<0.1
Endosulfan II	38	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Endosulfan Sulfate	38	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Endrin	4.7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1/<0.1	<0.1
Endrin Aldehyde	4.7	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.08	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04/<0.04	<0.04	<0.04/<0.04	<0.04
Endrin ketone	4.7	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.08	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04/<0.04	<0.04	<0.04/<0.04	<0.04
EPN	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Eptam	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Ethalfluralin	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Ethion	6.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Fenitrothion	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Fensulfothion	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Fenthion	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Folpet	1,400	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1/<0.1	<0.1
Fonofos	24	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
g-Chlordane	5.9	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Heptachlor	1.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Heptachlor epoxide	1.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Hexachlorobenzene	2.9	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Hexazinone	400	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Iodofenphos	NS	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Iprodione	480	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Isofenphos	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Lindane (BHC), gamma-	0.25	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Malaoxon	NS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1/<0.1	<0.1
Malathion	240	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Metalaxyl	740	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Methamidophos	0.62	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Methidathion	12.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Metolachlor	1,840	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Metribuzin (Sencor)	300	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Mevinphos (Phosdrin)	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Mirex	0.27	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Nitrofen	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Omethoate	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Parathion	74	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Parathion methyl	3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Pentachloronitrobenzene	19	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Permethrin	620	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Phorate (Thimet)	2.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Phosalone	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Phosmet	240	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Phosphamidon	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Pirimicarb	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Pirimiphos-ethyl	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Pirimiphos-methyl	122	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Procymidone	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Profenophos	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Profluralin	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Prometryn	48	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Pronamide	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Propazine	240	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Propiconazole	158	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Pyrazophos	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	Final Screening Criteria [1,2,3,4]	TP-3A	TP-3B	TP-4A	TP-4B	TP-5A	TP-5B	TP-6A	TP-6B	TP-7A	TP-7B	TP-8A	TP-8B	TP-9A	TP-9B	TP-10A	TP-10B	TP-11A	TP-11B	TP-12A	TP-12B	TP-13A	TP-13B
Sample Location																							
Sample Date		03/20/09	03/20/09	03/20/09	03/20/09	03/23/09	03/23/09	03/20/09	03/20/09	03/20/09	03/20/09	03/23/09	03/23/09	03/20/09	03/20/09	03/20/09	03/20/09	03/20/09	03/20/09	03/24/09	03/24/09	03/24/09	03/24/09
Sample ID:		O24689	O24690	O24691	O24692	O24693	O24694	O24695	O24697	O24698	O24699	O24700	O24701	O24702	O24703	O24704	O24705	O24706	O24707	O24708	O24709	O24710	O24711
Sample Depth (mbgs)		0.3 mbgs	2.4 mbgs	0.3 mbgs	3 mbgs	0.3 mbgs	1.8 mbgs	0.3 mbgs	2.6 mbgs	0.3 mbgs	3 mbgs	0.3 mbgs	2.7 mbgs	0.3 mbgs	3.4 mbgs	0.3 mbgs	2.1 mbgs	0.3 mbgs	2.7 mbgs	0.3 mbgs	2.1 mbgs	0.3 mbgs	2.1 mbgs
Quinalophos	6.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Ronnel	620	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Simazine	40	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Stirophos	200	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Sulfotepp	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Tecnazene	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Terbufos	0.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Terbuthylazine	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Terbutryne	12.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Tetradifon	NS	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Tolylfluanid	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Triadimefon	NS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Triallate	158	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Trifluralin	630	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Vinclozolin	300	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02

Notes:

All results and standards in µg/g, unless otherwise noted

(1) Atlantic Risk Based Corrective Action (RBCA) User Guidance for Petroleum Impacted Sites in Atlantic Canada, Version 2.0, Tier I Risk Based Screening Levels (RBSLs) for Soil: Residential, Non-Potable Groundwater, Coarse-Grained Soil.

(2) Canadian Environmental Quality Guidelines: Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Update 7.1, December 2007) - Residential Land Use, Human Health Guidelines, Soil Ingestion/Direct Contact.

(3) MOE Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009.

Appendix A2, Soil Components for Table 3 - Full Depth , Potable Water Scenario, Coarse Textured Soils, Residential/Parkland Land Use - Lower of S1 risk (soil contact), S-GW1 (soil leaching), S-IA (indoor air), Indoor Air Odour, and Outdoor Air, where available.

The MOE screening criterion are based on a 10-6 risk level for carcinogens and a hazard index of 0.2 for non-carcinogens. To be consistent with the target risk level of 10-5, the MOE criteria for carcinogens based on a risk of 10-6 were multipied by a factor of 10.

(4) Due to lack of screening criterion available, residential soil screening level taken from Regional Screening Levels (RSLs) table, November 2010.

The RSLs criteria are based on a 10^{-6} risk level for carcinogens and a hazard index of 1 for non-carcinogens. To be consistent with the target risk and hazard levels of 10^{-5} and 0.2, the RSLs criteria for carcinogens were multiplied by 10 and for non-carcinogens were divided by a factor of 5.

<0.01/<0.01 - Parent/Duplicate Sample

<0.02, Not detected at associated value.

--, Not analyzed.

NS, No Standard

mbgs, metres below ground surface

Concentration above the Final Screening Criteria

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Final Screening Criteria* [1,2,3,4]	*Sample Location*	*TP-14A*	*TP-14B*	*TP-15A*	*TP-15B*	*TP-16A*	*TP-16B*	*TP-17A*	*TP-17B*	*TP-18A*	*TP-18B*	*TP-19A*	*TP-19B*	*TP-20A*	*TP-20B*
		Sample Date	*03/24/09*	*03/24/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*
		Sample ID:	*O24712*	*O24713*	*O24714*	*O24715*	*O24716*	*O24717*	*O24718*	*O24719*	*O24720*	*O24721*	*O24722*	*O24723*	*O24724*	*O24725*
		Sample Depth (mbgs)	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*1.8 mbgs*	*0.3 mbgs*	*1.8 mbgs*	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*2.1 mbgs*
Benzene	0.16		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	14		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	58		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Xylenes (total)	17		--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C6-C10)	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C10-C21)	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
TPH (C21-C32)	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (gas source)	39		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (fuel oil source)	140		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Modified TPH (lube oil source)	690		--	--	--	--	--	--	--	--	--	--	--	--	--	--
2,4'-DDD	NS		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
2,4'-DDE	NS		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
2,4'-DDT + 4,4'-DDD	NS		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
4,4'-DDE	23		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
4,4'-DDT	23		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
4,4'-methoxychlor	NS		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
a-BHC	0.77		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Acephate	560		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
a-Chlordane	5.9		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Alachlor	87		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Aldrin	0.56		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Aspon	NS		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Atrazine	21		<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Azinophos methyl (Guthion)	NS		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Azinphos ethyl	NS		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
b-BHC	2.7		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Benfluralin	NS		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Bromacil	NS		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Bromophos	62		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Bromophos-ethyl	NS		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Butylate	620		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Captan	2,100		<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1/<0.1	<0.1
Carbophenothion	NS		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Chlorbenside	NS		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Chlorfenson(ovex)	NS		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Chlorfenvinphos(e/z)	8.6		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Chlormephos	NS		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Chlorothalonil (Daconil)	1,600		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Chlorpropham	2,400		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Chlorpyrifos	36		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Chlorpyriphos-methyl	122		<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Chlorthiophos	9.8		<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Cyanazine (Bladex)	5.8		<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Cyanophos	NS		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Dacthal	122		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
d-BHC	2.7		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Demeton	0.48		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Desethyl-atrazine	NS		<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Desmetryn	NS		<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Diallate(e/z)	80		<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Diazinon	8.6		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Dichlobenil	NS		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Dichlofenthion	NS		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Dichlofluanid	NS		<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Dichloran	NS		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Dichlorvos + Naled	NS		<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

	Sample Location	*TP-14A*	*TP-14B*	*TP-15A*	*TP-15B*	*TP-16A*	*TP-16B*	*TP-17A*	*TP-17B*	*TP-18A*	*TP-18B*	*TP-19A*	*TP-19B*	*TP-20A*	*TP-20B*
	Sample Date	*03/24/09*	*03/24/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/23/09*	*03/24/09*	*03/24/09*	*03/24/09*	*03/24/09*
	Sample ID:	*O24712*	*O24713*	*O24714*	*O24715*	*O24716*	*O24717*	*O24718*	*O24719*	*O24720*	*O24721*	*O24722*	*O24723*	*O24724*	*O24725*
	Sample Depth (mbgs)	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*1.8 mbgs*	*0.3 mbgs*	*1.8 mbgs*	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*2.1 mbgs*	*0.3 mbgs*	*2.1 mbgs*
Parameter	*Final Screening Criteria* [1,2,3,4]														
Dicofol	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Dicrotophos	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Dieldrin	0.94	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.3	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Dimethoate	2.4	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Dioxathion	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Diphenylamine	300	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Disulfoton (Di-Syston)	0.48	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Endosulfan I	38	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1/<0.1	<0.1
Endosulfan II	38	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Endosulfan Sulfate	38	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Endrin	4.7	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1/<0.1	<0.1
Endrin Aldehyde	4.7	<0.04	<0.04/<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04/<0.04	<0.04	<0.04/<0.04	<0.04
Endrin ketone	4.7	<0.04	<0.04/<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04/<0.04	<0.04	<0.04/<0.04	<0.04
EPN	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Eptam	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Ethalfluralin	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Ethion	6.2	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Fenitrothion	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Fensulfothion	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Fenthion	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Folpet	1,400	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1/<0.1	<0.1
Fonofos	24	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
g-Chlordane	5.9	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Heptachlor	1.5	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Heptachlor epoxide	1.1	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Hexachlorobenzene	2.9	<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Hexazinone	400	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Iodofenphos	NS	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Iprodione	480	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Isofenphos	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Lindane (BHC), gamma-	0.25	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Malaoxon	NS	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1	<0.1/<0.1	<0.1
Malathion	240	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Metalaxyl	740	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Methamidophos	0.62	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Methidathion	12.2	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Metolachlor	1,840	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Metribuzin (Sencor)	300	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Mevinphos (Phosdrin)	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Mirex	0.27	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Nitrofen	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Omethoate	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Parathion	74	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Parathion methyl	3	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Pentachloronitrobenzene	19	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Permethrin	620	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Phorate (Thimet)	2.4	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Phosalone	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Phosmet	240	<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Phosphamidon	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Pirimicarb	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Pirimiphos-ethyl	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Pirimiphos-methyl	122	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Procymidone	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Profenophos	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Profluralin	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Prometryn	48	<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Pronamide	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Propazine	240	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Propiconazole	158	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Pyrazophos	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02

TABLE B.1

SUMMARY OF SOIL ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	Final Screening Criteria [1,2,3,4]	Sample Location	TP-14A	TP-14B	TP-15A	TP-15B	TP-16A	TP-16B	TP-17A	TP-17B	TP-18A	TP-18B	TP-19A	TP-19B	TP-20A	TP-20B
		Sample Date	03/24/09	03/24/09	03/23/09	03/23/09	03/23/09	03/23/09	03/23/09	03/23/09	03/23/09	03/23/09	03/24/09	03/24/09	03/24/09	03/24/09
		Sample ID:	O24712	O24713	O24714	O24715	O24716	O24717	O24718	O24719	O24720	O24721	O24722	O24723	O24724	O24725
		Sample Depth (mbgs)	0.3 mbgs	2.1 mbgs	0.3 mbgs	1.8 mbgs	0.3 mbgs	1.8 mbgs	0.3 mbgs	2.1 mbgs	0.3 mbgs	2.1 mbgs	0.3 mbgs	2.1 mbgs	0.3 mbgs	2.1 mbgs
Quinalophos	6.2	<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03	<0.03/<0.03	<0.03
Ronnel	620	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Simazine	40	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01/<0.01	<0.01
Stirophos	200	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Sulfotepp	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Tecnazene	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Terbufos	0.3	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Terbuthylazine	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Terbutryne	12.2	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Tetradifon	NS	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Tolylfluanid	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Triadimefon	NS	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Triallate	158	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02
Trifluralin	630	<0.05	<0.05/<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05/<0.05	<0.05	<0.05/<0.05	<0.05
Vinclozolin	300	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02	<0.02/<0.02	<0.02

Notes:

All results and standards in µg/g, unless otherwise noted

(1) Atlantic Risk Based Corrective Action (RBCA) User Guidance for Petroleum Impacted Sites in Atlantic Canada, Version 2.0, Tier I Risk Based Screening Levels (RBSLs) for Soil: Residential, Non-Potable Groundwater, Coarse-Grained Soil.

(2) Canadian Environmental Quality Guidelines: Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Update 7.1, December 2007) - Residential Land Use, Human Health Guidelines, Soil Ingestion/Direct Contact.

(3) MOE Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009.
Appendix A2, Soil Components for Table 3 - Full Depth , Potable Water Scenario, Coarse Textured Soils, Residential/Parkland Land Use - Lower of S1 risk (soil contact), S-GW1 (soil leaching), S-IA (indoor air), Indoor Air Odour, and Outdoor Air, where available.
The MOE screening criterion are based on a 10-6 risk level for carcinogens and a hazard index of 0.2 for non-carcinogens. To be consistent with the target risk level of 10-5, the MOE criteria for carcinogens based on a risk of 10-6 were multipied by a factor of 10.

(4) Due to lack of screening criterion available, residential soil screening level taken from Regional Screening Levels (RSLs) table, November 2010.
The RSLs criteria are based on a 10^{-6} risk level for carcinogens and a hazard index of 1 for non-carcinogens. To be consistent with the
target risk and hazard levels of 10^{-5} and 0.2, the RSLs criteria for carcinogens were multiplied by 10 and for non-carcinogens were divided by a factor of 5.

<0.01/<0.01 - Parent/Duplicate Sample
<0.02, Not detected at associated value.
--, Not analyzed.
NS, No Standard
mbgs, metres below ground surface
Concentration above the Final Screening Criteria

TABLE B.2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Sample Location	*MW-1*	*MW-2*	*MW-3*	*MW-4*	*MW-5*	*MW-6*	*MW-7*	*MW-8*	*MW-9*	*MW-10*	*MW-11*	*MW-12*	*MW-13*	*MW-14*	*MW-16*
Sample Date	*03/27/09*	*03/27/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/27/09*	*03/26/09*	*03/27/09*	*03/27/09*	*03/27/09*	*03/27/09*	*03/27/09*
Sample ID:	*O26473*	*O26469*	*O25755*	*O25752*	*O25753*	*O25757*	*O25754*	*O25756*	*O26467*	*O25751*	*O26468*	*O26470*	*O26471*	*O26472*	*O26475*
Parameter															
2,4'-DDD	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4'-DDE	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4'-DDT + 4,4'-DDD	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4,4'-DDE	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4,4'-DDT	<0.01	<0.02/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.01
4,4'-methoxychlor	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
a-BHC	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
a-Chlordane	<0.06	<0.06/<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Alachlor	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Aspon	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Atrazine	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Azinophos methyl (Guthion)	<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Azinphos methyl	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
b-BHC	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benfluralin	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromacil	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Butylate	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Captan	<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Carbophenothion	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chlorbenside	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorfenson(ovex)	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorfenvinphos(e/z)	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlormephos	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorothalonil (Daconil)	<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorpropham	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorpyriphos-methyl	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorthiophos	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Cyanazine (Bladex)	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cyanophos	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dacthal	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
d-BHC	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Demeton	<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Desethyl-atrazine	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Desmetryn	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Diallate(e/z)	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dichlobenil	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dichlofenthion	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dichlofluanid	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloran	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorvox + Naled	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dicofol	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dicrotophos	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Dimethoate	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dioxathion	<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Diphenylamine	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton (Di-Syston)	<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Endosulfan I	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan II	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2

TABLE B.2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Sample Location	*MW-1*	*MW-2*	*MW-3*	*MW-4*	*MW-5*	*MW-6*	*MW-7*	*MW-8*	*MW-9*	*MW-10*	*MW-11*	*MW-12*	*MW-13*	*MW-14*	*MW-16*
Sample Date	*03/27/09*	*03/27/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/27/09*	*03/26/09*	*03/27/09*	*03/27/09*	*03/27/09*	*03/27/09*	*03/27/09*
Sample ID:	*O26473*	*O26469*	*O25755*	*O25752*	*O25753*	*O25757*	*O25754*	*O25756*	*O26467*	*O25751*	*O26468*	*O26470*	*O26471*	*O26472*	*O26475*
Parameter															
Endosulfan Sulfate	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	<0.2	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.04	<0.02	<0.04	<0.04	<0.04	<0.04	<0.02
Endrin Aldehyde	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin ketone	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
EPN	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Eptam	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethalfluralin	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Fenitrothion	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fensulfothion	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Folpet	<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Fonofos	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
g-Chlordane	<0.06	<0.06/<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Heptachlor	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobenzene	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Hexazinone	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iodofenphos	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iprodione	<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Isofenphos	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Lindane (BHC), gamma-	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Malaoxon	<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Malathion	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metalaxyl	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Methidathion	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Metolachlor	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Metribuzin (Sencor)	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Mevinphos (Phosdrin)	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Nitrofen	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Omethoate	<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Parathion	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion methyl	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pentachloronitrobenzene	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Permethrin	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phorate (Thimet)	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phosalone	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Phosmet	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Phosphamidon	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pirimicarb	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pirimiphos-ethyl	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pirimiphos-methyl	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Procymidone	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Profenophos	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Profluralin	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Prometryn	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pronamide	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Propazine	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Propiconazole	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrazophos	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Quinalophos	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Ronnel	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Simazine	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

TABLE B.2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Sample Location	*MW-1*	*MW-2*	*MW-3*	*MW-4*	*MW-5*	*MW-6*	*MW-7*	*MW-8*	*MW-9*	*MW-10*	*MW-11*	*MW-12*	*MW-13*	*MW-14*	*MW-16*
Sample Date	*03/27/09*	*03/27/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/26/09*	*03/27/09*	*03/26/09*	*03/27/09*	*03/27/09*	*03/27/09*	*03/27/09*	*03/27/09*
Sample ID:	*O26473*	*O26469*	*O25755*	*O25752*	*O25753*	*O25757*	*O25754*	*O25756*	*O26467*	*O25751*	*O26468*	*O26470*	*O26471*	*O26472*	*O26475*
Parameter															
Stirophos	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Sulfotepp	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tecnazene	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Terbufos	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Terbuthylazine	<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Terbutryne	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tetradifon	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tolylfluanid	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Triadimefon	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Triallate	<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Trifluralin	<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Vinclozolin	<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Notes:
All results and standards in µg/L, unless otherwise noted
<0.5/<0.5 - Parent/Duplicate Sample
<0.3, Not detected at associated value.

TABLE B.3

SUMMARY OF SEDIMENT ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Initial Screening Criteria* [1,2,3]	*Sample Location*	*SED-1*	*SED-2*	*SED-3*	*SED-4*	*SED-5*	*SED-6*	*SED-7*	*SED-8*	*SED-9*	*SED-10*	*SED-11*	*SED-12*	*SED-13*	*SED-14*	*SED-15*	*SED-16*	*SED-17*	*SED-18*	*SED-19*	*SED-20*	*SED-21*	*SED-22*	*SED-23*	*SED-24*	*SED-9*	*SED-19*	*SED-20*	*BACKGROUND*
		Sample Date	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*11/24/10*	*11/24/10*	*11/24/10*	*11/24/10*
		Sample ID:	*L746448-1*	*L746448-2*	*L746448-3*	*L746448-4*	*L746448-5*	*L746448-6*	*L746448-7*	*L746448-8*	*L746448-9*	*L746448-10*	*L746448-11*	*L746448-12*	*L746448-13*	*L746448-14*	*L746448-15*	*L746448-16*	*L746448-17*	*L746448-18*	*L746448-19*	*L746448-20*	*L746448-21*	*L746448-22*	*L746448-23*	*L746448-24*	*Oxley's Pond*	*Pond J*	*Pond K*	*Background Pond*
2,4'-DDD	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
2,4'-DDE	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
2,4'-DDT	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
4,4'-DDD	33		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
4,4'-DDE	23		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0016	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
4,4'-DDT	23		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
a-BHC	0.77		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Acephate	560		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010//<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	--	--	--	--
a-chlordane	5.9		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0027	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Alachlor	87		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Aldrin	0.56		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00055/0.00108	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00111	<0.00050	<0.00050	<0.00050	<0.00050	<0.0001	<0.0001	<0.0001	<0.0001
Aspon	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Atrazine	21		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Azinphos Ethyl	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
b-BHC	2.7		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Benfluralin	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Bromacil	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Bromophos	62		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Bromophos-ethyl	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Butylate	620		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Captan	2100		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0010//<0.0010	<0.0050	<0.0010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Carbophenothion	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Chlorbenside	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Chlorfenson (Ovex)	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Chlorfenvinphos	8.6		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Chlormephos	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Chlorothalonil	1600		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Chlorpropham	2400		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Chlorpyrifos	36		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Chlorpyrifos Methyl	122		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Chlorthiophos	9.8		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Cyanazine	5.8		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Cyanophos	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Dacthal	122		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
d-BHC	2.7		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Demeton	0.48		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Desethyl Atrazine	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Desmetryn	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Diallate	80		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Diazinon	8.6		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Dichlobenil	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Dichlofenthion	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Dichlofluanid	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010/0.0075	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0078	0.0015	<0.0010	<0.0010	<0.0010	<0.0010	<0.005	<0.005	<0.005	<0.005
Dichloran	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Dichlorvos + Naled	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Dicofol	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Dicrotophos	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Dieldrin	0.94		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050/<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00057	<0.0001	<0.0001	<0.0001
Dimethoate	2.4		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Dioxathion	NS		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Diphenylamine	300		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Disulfoton	0.48		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Endosulfan I	38		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Endosulfan II	38		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Endosulfan Sulfate	38		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Endrin	4.7		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Endrin Aldehyde	4.7		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Endrin Ketone	4.7		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
EPN	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Eptam	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Ethalfluralin	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Ethion	6.2		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Fenitrothion	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Fensulfothion	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Fenthion	NS		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Folpet	1400		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Fonofos	24		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
g-chlordane	5.9		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0023	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Guthion	NS		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--

TABLE B.3

SUMMARY OF SEDIMENT ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Initial Screening Criteria* [1,2,3]	*SED-1*	*SED-2*	*SED-3*	*SED-4*	*SED-5*	*SED-6*	*SED-7*	*SED-8*	*SED-9*	*SED-10*	*SED-11*	*SED-12*	*SED-13*	*SED-14*	*SED-15*	*SED-16*	*SED-17*	*SED-18*	*SED-19*	*SED-20*	*SED-21*	*SED-22*	*SED-23*	*SED-24*	*SED-9*	*SED-19*	*SED-20*	*BACKGROUND*
Sample Location																													
Sample Date		*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*11/24/10*	*11/24/10*	*11/24/10*	*11/24/10*
Sample ID:		*L746448-1*	*L746448-2*	*L746448-3*	*L746448-4*	*L746448-5*	*L746448-6*	*L746448-7*	*L746448-8*	*L746448-9*	*L746448-10*	*L746448-11*	*L746448-12*	*L746448-13*	*L746448-14*	*L746448-15*	*L746448-16*	*L746448-17*	*L746448-18*	*L746448-19*	*L746448-20*	*L746448-21*	*L746448-22*	*L746448-23*	*L746448-24*	*Oxley's Pond*	*Pond J*	*Pond K*	*Background Pond*
Heptachlor	1.5	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0067	<0.0010	<0.0010	<0.0010	<0.0010	0.00142	<0.0001	0.0007	<0.0001
Heptachlor epoxide	1.1	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0036	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Hexachlorobenzene	2.9	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Hexazinone	400	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Iodofenphos	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Iprodione	480	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Isofenphos	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Lindane (gamma - BHC)	0.25	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Malaoxon	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Malathion	240	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Metalaxyl	740	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Methamidophos	0.62	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Methidathion	12.2	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Methoxychlor	0.38	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Metolachlor	1840	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Metribuzin	300	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Mevinphos	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Mirex	0.27	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0001	<0.0001	<0.0001	<0.0001
Nitrofen	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Omethoate	NS	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Parathion	74	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Parathion Methyl	3	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Pentachloronitrobenzene	19	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0014	<0.0010	<0.0010	<0.0010	<0.0010	<0.005	<0.005	<0.005	<0.005
Permethrin	620	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Phorate	2.4	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050/<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	--	--	--	--
Phosalone	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Phosmet	240	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Phosphamidon	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Pirimicarb	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Pirimiphos-ethyl	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Pirimiphos-methyl	122	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Procymidone	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Profenophos	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0018	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.005	<0.005	<0.005	<0.005
Profluralin	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Prometryn	48	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Pronamide	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Propazine	240	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0034	0.0023	<0.0010	<0.0010	<0.0010	<0.0010	<0.005	<0.005	<0.005	<0.005
Propiconazole	158	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Pyrazophos	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Quinalphos	6.2	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Ronnel	620	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Simazine	40	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Stirophos	200	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Sulfotepp	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Tecnazene	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Terbufos	0.3	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Terbuthylazine	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Terbutryne	12.2	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Tetradifon	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Tolyfluanid	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Triadimefon	NS	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Triallate	158	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Trifluralin	630	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--
Vinclozolin	300	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010//<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	--	--	--	--

Notes:

All results and standards in µg/g, unless otherwise noted

(1) Canadian Environmental Quality Guidelines: Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Update 7.1, December 2007) - Residential Land Use, Human Health Guidelines, Soil Ingestion/Direct Contact.

(2) MOE Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009.
Appendix A3, Groundwater Components for Potable Water Scenario, Coarse Textured Soils, Residential Land Use - Lower of GW1, GW1 Odour, Resdiential GW2, and Residential GW2 Odour, where available.
The MOE screening criterion are based on a 10^{-6} risk level for carcinogens and a hazard index of 0.2 for non-carcinogens. To be consistent with the target risk level of 10^{-5}, the MOE criteria for carcinogens based on a risk of 10^{-6} were multipied by a factor of 10.

(3) Due to lack of screening criterion available, tapwater screening level taken from Regional Screening Levels (RSLs) table, May 26, 2010.
The RSLs criteria are based on a 10^{-6} risk level for carcinogens and a hazard index of 1 for non-carcinogens. To be consistent with the
target risk and hazard levels of 10^{-5} and 0.2, the RSLs criteria for carcinogens were multiplied by 10 and for non-carcinogens were divided by a factor of 5.

<0.01/<0.01 - Parent/Duplicate Sample

<0.001, Not detected at associated value.

--, Not analyzed.

NS, No Standard

TABLE B.4

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Sample Location	*SW1*	*SW-1*	*SW-2*	*SW-3*	*SW-4*	*SW-5*	*SW-6*	*SW-7*	*SW-8*	*SW-9*	*SW-10*	*SW-11*	*SW-12*	*SW-13*	*SW-14*	*SW-15*	*SW-16*	*SW-17*	*SW-18*	*SW-19*	*SW-20*	*SW-21*	*SW-22*	*SW-23*	*SW-24*
Sample Date	*06/30/04*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*
Sample ID:	*40443-SW1*	*O17938*	*O17939*	*O17940*	*O17941*	*O17942*	*O17943*	*O17944*	*O17945*	*O17946*	*O17947*	*O17948*	*O17949*	*O17950*	*O17951*	*O17952*	*O17953*	*O17954*	*O17955*	*O17956*	*O17957*	*O17958*	*O17959*	*O17960*	*O17961*
Parameter																									
2,4'-DDD	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01/<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4'-DDE	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01/<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
2,4'-DDT + 4,4'-DDD	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01/<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4,4'-DDE	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01/<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4,4'-DDT	--	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6/<0.6	<0.6/<0.1	<0.6/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.1
4,4'-methoxychlor	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.1
a-BHC	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
a-Chlordane	<0.5	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06/<0.06	<0.06/<0.06	<0.06/<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Alachlor	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aldrin	<0.3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02/<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Aspon	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Atrazine	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Azinophos methyl (Guthion)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1/<1	<1/<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Azinphos ethyl	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
b-BHC	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Benfluralin	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromacil	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Butylate	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Captan	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1/<3	<1/<1	<1/<3	<1	<1	<1	<1	<1	<1	<3	<3	<3	<3	<3	<3	<1
Carbophenothion	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chlorbenside	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorfenson(ovex)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorfenvinphos(e/z)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlormephos	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorothalonil (Daconil)	<1	<1	<0.2	<1	<1	<1	<1	<1	<1	<1/<1	<1/<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chlorpropham	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorpyrifos	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01/<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorpyriphos-methyl	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorthiophos	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Cyanazine (Bladex)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cyanophos	<2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dacthal	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
d-BHC	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Demeton	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1/<1	<1/<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Desethyl-atrazine	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Desmetryn	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Diallate(e/z)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	<0.3	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02/<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Dichlobenil	<0.2	<0.2	<0.3	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dichlofenthion	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dichlofluanid	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloran	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorvox + Naled	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dicofol	<0.2	<0.2	<0.4	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dicrotophos	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dieldrin	<0.5	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03/<0.03	<0.03/<0.03	<0.03/<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Dimethoate	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dioxathion	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1/<1	<1/<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Diphenylamine	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Disulfoton (Di-Syston)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1/<1	<1/<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Endosulfan I	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan II	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endosulfan Sulfate	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Endrin	<0.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02/<0.02	<0.02/<0.02	<0.02/<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02
Endrin Aldehyde	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Endrin ketone	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.6	<0.5/<0.5	<0.5/<0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.5
EPN	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Eptam	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethalfluralin	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethion	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Fenitrothion	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fensulfothion	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fenthion	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Folpet	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1/<3	<1/<1	<1/<3	<1	<1	<1	<1	<1	<1	<3	<3	<3	<3	<3	<3	<1
Fonofos	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
g-Chlordane	<0.5	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06/<0.06	<0.06/<0.06	<0.06/<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Heptachlor	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor epoxide	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

TABLE B.4

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Sample Location	*SW1*	*SW-1*	*SW-2*	*SW-3*	*SW-4*	*SW-5*	*SW-6*	*SW-7*	*SW-8*	*SW-9*	*SW-10*	*SW-11*	*SW-12*	*SW-13*	*SW-14*	*SW-15*	*SW-16*	*SW-17*	*SW-18*	*SW-19*	*SW-20*	*SW-21*	*SW-22*	*SW-23*	*SW-24*
Sample Date	*06/30/04*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*	*03/19/09*
Sample ID:	*40443-SW1*	*O17938*	*O17939*	*O17940*	*O17941*	*O17942*	*O17943*	*O17944*	*O17945*	*O17946*	*O17947*	*O17948*	*O17949*	*O17950*	*O17951*	*O17952*	*O17953*	*O17954*	*O17955*	*O17956*	*O17957*	*O17958*	*O17959*	*O17960*	*O17961*
Parameter																									
Hexachlorobenzene	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Hexazinone	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iodofenphos	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Iprodione	--	<1	<1	<1	<1	<1	<1	<1	<1	<1/<1	<1/<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Isofenphos	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Lindane (BHC), gamma-	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Malaoxon	<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1/<1	<1/<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Malathion	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Metalaxyl	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Methidathion	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Metolachlor	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Metribuzin (Sencor)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Mevinphos (Phosdrin)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mirex	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Nitrofen	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Omethoate	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1/<1	<1/<1	<1/<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Parathion	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion methyl	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pentachloronitrobenzene	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Permethrin	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phorate (Thimet)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phosalone	<0.2	<0.2	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Phosmet	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Phosphamidon	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pirimicarb	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pirimiphos-ethyl	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pirimiphos-methyl	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Procymidone	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Profenophos	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Profluralin	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Prometryn	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pronamide	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Propazine	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Propiconazole	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrazophos	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Quinalophos	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Ronnel	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Simazine	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Stirophos	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Sulfotepp	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tecnazene	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Terbufos	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Terbuthylazine	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1/<0.1	<0.1/<0.1	<0.1/<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Terbutryne	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tetradifon	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tolylfluanid	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Triadimefon	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Triallate	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3/<0.3	<0.3/<0.3	<0.3/<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Trifluralin	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2/<0.2	<0.2/<0.2	<0.2/<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Vinclozolin	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5/<0.5	<0.5/<0.5	<0.5/<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Notes:
All results and standards in µg/L, unless otherwise noted
<0.5/<0.5 - Parent/Duplicate Sample
<0.3, Not detected at associated value.

TABLE B.5

SUMMARY OF FISH TISSUE ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Sample Location:	*OXLEY'S POND*	*OXLEY'S POND*	*OXLEY'S POND*	*OXLEY'S POND*	*OXLEY'S POND*	*OXLEY'S POND*	*OXLEY'S POND*	*OXLEY'S POND*	*OXLEY'S POND*	*POND J*	*POND J*	*POND J*	*POND J*	*POND J*
Sample No.:	*FILLET ANALYSIS #1*	*FILLET ANALYSIS #2*	*FILLET ANALYSIS #3*	*FILLET ANALYSIS #4*	*FILLET ANALYSIS #5*	*WHOLE FISH #6*	*WHOLE FISH #7*	*WHOLE FISH #8*	*COMPOSITE SAMPLE #9*	*FILLET ANALYSIS #1*	*FILLET ANALYSIS #2*	*FILLET ANALYSIS #3*	*FILLET ANALYSIS #4*	*FILLET ANALYSIS #5*
Sample Date:	*12/8/2010*	*12/8/2010*	*12/8/2010*	*12/8/2010*	*12/8/2010*	*12/8/2010*	*12/8/2010*	*12/8/2010*	*12/8/2010*	*12/6/2010*	*12/6/2010*	*12/6/2010*	*12/6/2010*	*12/6/2010*
Parameter														
2,4′-DDD	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4′-DDE	<0.10	<0.10	<0.10	0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4′-DDT	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4′-DDD	<0.10	0.33	<0.10	<0.10	<0.10	<0.10	0.32	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4′-DDE	3.95	0.78	0.54	5.75	1.82	1.76	10.4	2.42	2.73	0.29	0.81	0.39	0.33	0.39
4,4′-DDT	0.81	0.3	0.25	0.89	0.45	0.74	0.75	0.78	0.88	0.29 ABL	<0.10	<0.10	<0.10	<0.10
Aldrin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
alpha-BHC	<0.10	<0.10	<0.10	<0.10	<0.10	0.11	<0.10	0.14	0.22	<0.10	<0.10	<0.10	<0.10	<0.10
alpha-Chlordane	0.42	<0.10	<0.10	0.45	0.17	<0.10	<0.10	0.51	0.61	<0.10	<0.10	<0.10	<0.10	<0.10
beta-BHC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
delta-BHC	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dieldrin	1.37	0.54	0.11	0.81	1.7	11.1	3.35	5.75	3.16	0.12	0.11 ABL	0.2	0.16	0.21
Endosulfan I	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan II	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan Sulfate	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Aldehyde	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Ketone	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-BHC (Lindane)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-Chlordane	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.1	0.18	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor Epoxide	<0.10	<0.10	<0.10	<0.10	<0.10	0.28 ABL	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Hexachlorobenzene	0.44	0.14	<0.10	0.2	0.12	<0.10	<0.10	0.32	0.29	<0.10	<0.10	0.12	0.1	0.1
Methoxychlor	<0.10	0.62	<0.10	0.74	0.46	<0.10	<0.10	0.53	<0.10	<0.10	<0.10	<0.10	<0.10	0.35
Mirex	0.1	<0.10	<0.10	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
PCNB	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Profenofos	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Propazine	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Trans-nonachlor	1.12	0.16	<0.10	1.54	1.06	<0.10	0.46	2	0.76	<0.10	0.17	0.14	<0.10	<0.10

Notes:

All results and standards in µg/kg, unless otherwise noted

<0.001, Not detected at associated value.

ABL, Approximate Result: May Be Biased Low

NS, No Standard

TABLE B.5

SUMMARY OF FISH TISSUE ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Parameter	*Final Screening Criteria* [1,2]	*Sample Location:*	*POND J*	*POND J*	*POND J*	*POND J*	*POND J*	*POND K*	*POND K*	*POND K*	*POND K*	*POND K*	*POND K*	*POND K*	*POND K*	*POND K*	*POND K*
		Sample No.:	*WHOLE FISH #6*	*WHOLE FISH #7*	*WHOLE FISH #8*	*WHOLE FISH #9*	*COMPOSITE SAMPLE #10*	*FILLET ANALYSIS #1*	*FILLET ANALYSIS #2*	*FILLET ANALYSIS #3*	*FILLET ANALYSIS #4*	*FILLET ANALYSIS #5*	*WHOLE FISH #6*	*WHOLE FISH #7*	*WHOLE FISH #8*	*WHOLE FISH #9*	*COMPOSITE SAMPLE #10*
		Sample Date:	*12/6/2010*	*12/6/2010*	*12/6/2010*	*12/6/2010*	*12/6/2010*	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/3/2010*	*12/3/2010*
2,4'-DDD	NS		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4'-DDE	NS		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4'-DDT	NS		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4'-DDD	NS		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4'-DDE	NS		0.4	0.47	0.31	0.26	0.45	1.04	0.53	0.37	0.27	0.61	0.14	0.34	0.25	0.21	0.32
4,4'-DDT	8.6		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.27	<0.10	<0.10	<0.10	<0.10
Aldrin	1.3		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
alpha-BHC	NS		<0.10	<0.10	<0.10	<0.10	0.15	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.13
alpha-Chlordane	17		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
beta-BHC	NS		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
delta-BHC	NS		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dieldrin	0.18		0.15	0.16	0.21	0.24	0.43	0.25	0.14	0.18	<0.10	0.18	0.1	0.16	0.17	<0.10	0.34
Endosulfan I	1800		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan II	1800		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan Sulfate	1800		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin	88		0.11 ABL	<0.10	<0.10	<0.10	0.15	0.23	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Aldehyde	88		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Ketone	88		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-BHC (Lindane)	2.3		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-Chlordane	17		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor	5		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor Epoxide	0.32		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Hexachlorobenzene	1.8		0.14	0.19	<0.10	0.11	0.27	0.13	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.24
Methoxychlor	NS		<0.10	<0.10	0.45	0.47	<0.10	<0.10	0.42	0.34	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Mirex	59		<0.10	<0.10	<0.10	0.12	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
PCNB	NS		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Profenofos	NS		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Propazine	NS		<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Trans-nonachlor	17		<0.10	0.14 ABL	<0.10	<0.10	0.17	<0.10	<0.10	0.11	<0.10	0.18	<0.10	<0.10	<0.10	<0.10	<0.10

Notes:

All results and standards in µg/kg, unless otherwise noted

<0.001, Not detected at associated value.

ABL, Approximate Result: May Be Biased Low

NS, No Standard

Concentration above the Final Screening Criteria

TABLE B.5

SUMMARY OF FISH TISSUE ANALYTICAL RESULTS
HHERA
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

	Sample Location:	*REF POND*	*REF POND*	*REF POND*	*REF POND*	*REF POND*	*REF POND*	*REF POND*	*REF POND*	*REF POND*	*REF POND*
	Sample No.:	*FILLET ANALYSIS #1*	*FILLET ANALYSIS #2*	*FILLET ANALYSIS #3*	*FILLET ANALYSIS #4*	*FILLET ANALYSIS #5*	*WHOLE FISH #6*	*WHOLE FISH #7*	*WHOLE FISH #8*	*WHOLE FISH #9*	*COMPOSITE SAMPLE #10*
	Sample Date:	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*	*12/1/2010*
Parameter	*Final Screening Criteria* [1,2]										
2,4′-DDD	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4′-DDE	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
2,4′-DDT	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4′-DDD	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4′-DDE	NS	0.72	0.66	0.74	0.24	0.41	0.21	0.19	0.66	0.2	0.13 ABL
4,4′-DDT	8.6	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Aldrin	1.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
alpha-BHC	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.18
alpha-Chlordane	17	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
beta-BHC	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
delta-BHC	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Dieldrin	0.18	0.16	0.27	<0.10	0.25	0.32	0.23	0.19	0.17	0.35	0.42
Endosulfan I	1800	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan II	1800	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endosulfan Sulfate	1800	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin	88	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.21 ABL	<0.10
Endrin Aldehyde	88	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Endrin Ketone	88	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-BHC (Lindane)	2.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
gamma-Chlordane	17	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor	5	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Heptachlor Epoxide	0.32	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Hexachlorobenzene	1.8	<0.10	<0.10	<0.10	<0.10	0.13	0.13	<0.10	<0.10	0.12	<0.10
Methoxychlor	NS	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Mirex	59	<0.10	<0.10	<0.10	<0.10	<0.10	0.23	<0.10	<0.10	<0.10	<0.10
PCNB	NS	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Profenofos	NS	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Propazine	NS	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Trans-nonachlor	17	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10

Notes:

All results and standards in µg/kg, unless otherwise noted

<0.001, Not detected at associated value.

ABL, Approximate Result: May Be Biased Low

NS, No Standard

Concentration above the Final Screening Criteria

APPENDIX C

LABORATORY CERTIFICATES OF ANALYSIS

CONESTOGA ROVERS & ASSOCIATES (CRA)
ATTN: MR.TROY SMALL
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Phone: 506-458-1248

Date Received: 30-NOV-10
Report Date: 13-JAN-11 11:48 (MT)
Version: FINAL

Certificate of Analysis

Lab Work Order #: L958466
Project P.O. #: NOT SUBMITTED
Job Reference: 072004
Legal Site Desc:
C of C Numbers:

Brent Finnestad
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L958466-1 SED-9 (OXLEY'S POND)							
Sampled By: PETER GILLINGHAM on 24-NOV-10 @ 14:30							
Matrix: SEDIMENT							
Total Organic Carbon -Inorg & Total C							
Inorganic and Organic Carbon							
Inorganic Carbon	0.23		0.10	%	07-DEC-10	07-DEC-10	R1705903
Total Organic Carbon	12.1		0.10	%	07-DEC-10	07-DEC-10	R1705903
CaCO3 Equivalent	2.85		0.70	%	07-DEC-10	07-DEC-10	R1705903
Total Carbon by combustion method							
Total Carbon by Combustion	12.3		0.1	%	06-DEC-10	06-DEC-10	R1706404
Miscellaneous Parameters							
% Moisture	90.7		0.10	%		01-DEC-10	R1682003
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	5.63		0.10	%	09-DEC-10	10-DEC-10	R1722643
% Silt (0.05mm - 2um)	60.0		0.10	%	09-DEC-10	10-DEC-10	R1722643
% Clay (<2um)	34.4		0.10	%	09-DEC-10	10-DEC-10	R1722643
Texture	Silty clay loam				09-DEC-10	10-DEC-10	R1722643
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
beta-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
delta-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Heptachlor	1.42		0.10	ug/kg		20-DEC-10	R1772563
Aldrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Heptachlor Epoxide	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan I	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Dieldrin	0.57		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDE	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan II	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDD	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan Sulfate	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDT	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Methoxychlor	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin Ketone	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin Aldehyde	<0.10		0.10	ug/kg		20-DEC-10	R1772563
alpha-Chlordane	<0.10		0.10	ug/kg		20-DEC-10	R1772563
gamma-Chlordane	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Hexachlorobenzene	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Trans-nonachlor	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Mirex	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDE	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDT	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDD	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Surrogate: Tetrachloro-m-xylene	57		30-140	%		20-DEC-10	R1772563
Surrogate: Decachlorobiphenyl	85		50-150	%		20-DEC-10	R1772563
Special Request Centre of Excellence							
Surrogate: Treflan d14	92		50-150	%	29-DEC-10	07-JAN-11	R1812405
Dichlofluanid	<0.0050		0.0050	mg/kg	29-DEC-10	07-JAN-11	R1812405
Pentachloronitrobenzene	<0.0050		0.0050	mg/kg	29-DEC-10	07-JAN-11	R1812405
Profenofos	<0.0050		0.0050	mg/kg	29-DEC-10	07-JAN-11	R1812405
Propazine	<0.0050		0.0050	mg/kg	29-DEC-10	07-JAN-11	R1812405
L958466-2 SED-19 (POND J)							
Sampled By: PETER GILLINGHAM on 24-NOV-10 @ 12:30							
Matrix: SEDIMENT							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L958466-2 SED-19 (POND J)							
Sampled By: PETER GILLINGHAM on 24-NOV-10 @ 12:30							
Matrix: SEDIMENT							
Total Organic Carbon -Inorg & Total C							
Inorganic and Organic Carbon							
Inorganic Carbon	0.17		0.10	%	07-DEC-10	07-DEC-10	R1705903
Total Organic Carbon	23.9		0.10	%	07-DEC-10	07-DEC-10	R1705903
CaCO3 Equivalent	2.12		0.70	%	07-DEC-10	07-DEC-10	R1705903
Total Carbon by combustion method							
Total Carbon by Combustion	24.1		0.1	%	06-DEC-10	06-DEC-10	R1706404
Miscellaneous Parameters							
% Moisture	87.3		0.10	%		01-DEC-10	R1682003
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	64.6		0.10	%	09-DEC-10	10-DEC-10	R1722643
% Silt (0.05mm - 2um)	32.6		0.10	%	09-DEC-10	10-DEC-10	R1722643
% Clay (<2um)	2.74		0.10	%	09-DEC-10	10-DEC-10	R1722643
Texture	Sandy loam				09-DEC-10	10-DEC-10	R1722643
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
beta-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
delta-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Heptachlor	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Aldrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Heptachlor Epoxide	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan I	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Dieldrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDE	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan II	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDD	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan Sulfate	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDT	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Methoxychlor	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin Ketone	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin Aldehyde	<0.10		0.10	ug/kg		20-DEC-10	R1772563
alpha-Chlordane	<0.10		0.10	ug/kg		20-DEC-10	R1772563
gamma-Chlordane	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Hexachlorobenzene	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Trans-nonachlor	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Mirex	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDE	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDT	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDD	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Surrogate: Tetrachloro-m-xylene	48		30-140	%		20-DEC-10	R1772563
Surrogate: Decachlorobiphenyl	85		50-150	%		20-DEC-10	R1772563
Special Request Centre of Excellence							
Surrogate: Treflan d14	110		50-150	%	29-DEC-10	05-JAN-11	R1812405
Dichlofluanid	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
Pentachloronitrobenzene	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
Profenofos	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
Propazine	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
L958466-3 SED-20 (POND K)							
Sampled By: PETER GILLINGHAM on 24-NOV-10 @ 10:30							
Matrix: SEDIMENT							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L958466-3 SED-20 (POND K)							
Sampled By: PETER GILLINGHAM on 24-NOV-10 @ 10:30							
Matrix: SEDIMENT							
Total Organic Carbon -Inorg & Total C							
Inorganic and Organic Carbon							
Inorganic Carbon	<0.10		0.10	%	07-DEC-10	07-DEC-10	R1705903
Total Organic Carbon	5.01		0.10	%	07-DEC-10	07-DEC-10	R1705903
CaCO3 Equivalent	1.15		0.70	%	07-DEC-10	07-DEC-10	R1705903
Total Carbon by combustion method							
Total Carbon by Combustion	5.0		0.1	%	06-DEC-10	06-DEC-10	R1706404
Miscellaneous Parameters							
% Moisture	89.1		0.10	%		01-DEC-10	R1682003
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	2.98		0.10	%	09-DEC-10	10-DEC-10	R1722643
% Silt (0.05mm - 2um)	74.4		0.10	%	09-DEC-10	10-DEC-10	R1722643
% Clay (<2um)	22.6		0.10	%	09-DEC-10	10-DEC-10	R1722643
Texture	Silt loam				09-DEC-10	10-DEC-10	R1722643
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
beta-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
delta-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Heptachlor	0.70		0.10	ug/kg		20-DEC-10	R1772563
Aldrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Heptachlor Epoxide	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan I	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Dieldrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDE	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan II	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDD	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan Sulfate	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDT	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Methoxychlor	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin Ketone	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin Aldehyde	<0.10		0.10	ug/kg		20-DEC-10	R1772563
alpha-Chlordane	<0.10		0.10	ug/kg		20-DEC-10	R1772563
gamma-Chlordane	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Hexachlorobenzene	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Trans-nonachlor	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Mirex	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDE	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDT	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDD	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Surrogate: Tetrachloro-m-xylene	57		30-140	%		20-DEC-10	R1772563
Surrogate: Decachlorobiphenyl	83		50-150	%		20-DEC-10	R1772563
Special Request Centre of Excellence							
Surrogate: Treflan d14	89		50-150	%	29-DEC-10	05-JAN-11	R1812405
Dichlofluanid	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
Pentachloronitrobenzene	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
Profenofos	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
Propazine	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
L958466-4 BACKGROUND (BACKGROUND POND)							
Sampled By: PETER GILLINGHAM on 24-NOV-10 @ 16:00							
Matrix: SEDIMENT							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L958466-4 BACKGROUND (BACKGROUND POND)							
Sampled By: PETER GILLINGHAM on 24-NOV-10 @ 16:00							
Matrix: SEDIMENT							
Total Organic Carbon -Inorg & Total C							
Inorganic and Organic Carbon							
Inorganic Carbon	0.22		0.10	%	07-DEC-10	07-DEC-10	R1705903
Total Organic Carbon	28.2		0.10	%	07-DEC-10	07-DEC-10	R1705903
CaCO3 Equivalent	2.68		0.70	%	07-DEC-10	07-DEC-10	R1705903
Total Carbon by combustion method							
Total Carbon by Combustion	28.5		0.1	%	06-DEC-10	06-DEC-10	R1706404
Miscellaneous Parameters							
% Moisture	91.1		0.10	%		01-DEC-10	R1682003
Particle size - Pipette removal OM & CO3							
% Sand (2.0mm - 0.05mm)	46.3		0.10	%	09-DEC-10	10-DEC-10	R1722643
% Silt (0.05mm - 2um)	41.0		0.10	%	09-DEC-10	10-DEC-10	R1722643
% Clay (<2um)	12.7		0.10	%	09-DEC-10	10-DEC-10	R1722643
Texture	Loam				09-DEC-10	10-DEC-10	R1722643
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
beta-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
delta-BHC	<0.10		0.10	ug/kg		20-DEC-10	R1772563
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Heptachlor	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Aldrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Heptachlor Epoxide	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan I	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Dieldrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDE	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan II	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDD	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endosulfan Sulfate	<0.10		0.10	ug/kg		20-DEC-10	R1772563
4,4'-DDT	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Methoxychlor	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin Ketone	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Endrin Aldehyde	<0.10		0.10	ug/kg		20-DEC-10	R1772563
alpha-Chlordane	<0.10		0.10	ug/kg		20-DEC-10	R1772563
gamma-Chlordane	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Hexachlorobenzene	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Trans-nonachlor	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Mirex	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDE	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDT	<0.10		0.10	ug/kg		20-DEC-10	R1772563
2,4'-DDD	<0.10		0.10	ug/kg		20-DEC-10	R1772563
Surrogate: Tetrachloro-m-xylene	54		30-140	%		20-DEC-10	R1772563
Surrogate: Decachlorobiphenyl	77		50-150	%		20-DEC-10	R1772563
Special Request Centre of Excellence							
Surrogate: Treflan d14	87		50-150	%	29-DEC-10	05-JAN-11	R1812405
Dichlofluanid	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
Pentachloronitrobenzene	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
Profenofos	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405
Propazine	<0.0050		0.0050	mg/kg	29-DEC-10	05-JAN-11	R1812405

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Laboratory Control Sample	Dichlofluanid	LCS-H	L958466-1, -2, -3, -4

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
C-INORG-ORG-SK	Soil	Inorganic and Organic Carbon	SSSA (1996) P455-456

When carbonates are decomposed with acid in an open system, carbon dioxide is released to the atmosphere. The decrease in sample weight resulting from CO2 loss is proportional to the carbonate content of the soil.

Reference:
Loeppert, R.H. and Suarez, D.L. 1996. Gravimetric Method for Loss of Carbon Dioxide. P. 455-456 In: J.M. Bartels et al. (ed.) Methods of soil analysis: Part 3 Chemical methods. (3rd ed.) ASA and SSSA, Madison, WI. Book series no. 5

C-TOT-LECO-SK	Soil	Total Carbon by combustion method	SSSA (1996) P. 973-974

The sample is introduced into a quartz tube where it undergoes combustion at 900 C in the presence of oxygen.
Combustion gases are first carried through a catalyst bed in the bottom of the combustion tube, where oxidation is completed and then carried through a reducing agent (copper), where the nitrogen oxides are reduced to elemental nitrogen.
This mixture of N2, CO2, and H2O is then passed through an absorber column containing magnesium perchlorate to remove water. N2 and CO2 gases are then separated in a gas chromatographic column and detected by thermal conductivity.

Reference:
Nelson, D.W. and Sommers, L.E. 1996. Total Carbon, organic carbon and organic matter. P. 973-974 In: J.M. Bartels et al. (ed.) Methods of soil analysis: Part 3 Chemical methods. (3rd ed.) ASA and SSSA, Madison, WI. Book series no. 5

OCSCREEN-POP-ED	Soil	POP Organo-chlorine screen	EPA 8081 GC/ECD
PREP-MOISTURE-ED	Soil	% Moisture	Oven dry 105C-Gravimetric
PSA-3-SK	Soil	Particle size - Pipette removal OM & CO3	Forestry Canada (1991) p. 46-53

Dry, < 2 mm soil is treated hydrochloric acid top remove carbonates, then hydrogen peroxide to remove organic matter. The remaining soil is treated with sodium hexametaphosphate to ensure complete dispersion of primary soil particles. The homogenized suspension is allowed to settle in accordance with Stoke's Law so that only clay particles remain in suspension.To determine the clay fraction, an aliquot of the clay suspension is removed, then dried and weighed. The sand fraction is determined by wet sieving the remaining suspension, then drying and weighing the sand retained on the sieve. The silt fraction is determined by calculation where % Silt = 100 - (%Sand+%Clay)

Reference:
Burt, R. (2009). Soil Survey Field and Laboratory Methods Manual. Soil Survey Investigations Report No. 5. Method 3.2.1.2.2. United States Department of Agriculture Natural Resources Conservation Service.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA
SK	ALS LABORATORY GROUP - SASKATOON, SASKATCHEWAN, CANADA

Chain of Custody Numbers:

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L958466 Report Date: 13-JAN-11

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5

Contact: MR.TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SPECIAL REQ-EX	**Misc.**							
Batch R1812405								
WG1222447-5 DUP		**L958466-2**						
Dichlofluanid		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	05-JAN-11
Pentachloronitrobenzene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	05-JAN-11
Profenofos		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	05-JAN-11
Propazine		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	05-JAN-11
WG1222447-6 DUP		**L958466-3**						
Dichlofluanid		<0.0050	<0.0050	**RPD-NA**	mg/kg	N/A	50	05-JAN-11
Pentachloronitrobenzene		<0.0050	<0.0050	**RPD-NA**	mg/kg	N/A	50	05-JAN-11
Profenofos		<0.0050	<0.0050	**RPD-NA**	mg/kg	N/A	50	05-JAN-11
Propazine		<0.0050	<0.0050	**RPD-NA**	mg/kg	N/A	50	05-JAN-11
WG1222447-3 LCS								
Propazine			95		%		50-150	05-JAN-11
Dichlofluanid			190	LCS-H	%		50-150	05-JAN-11
Pentachloronitrobenzene			72		%		50-150	05-JAN-11
Profenofos			91		%		50-150	05-JAN-11
WG1222447-2 MB								
Dichlofluanid			<0.0050		mg/kg		0.005	05-JAN-11
Pentachloronitrobenzene			<0.0050		mg/kg		0.005	05-JAN-11
Profenofos			<0.0050		mg/kg		0.005	05-JAN-11
Propazine			<0.0050		mg/kg		0.005	05-JAN-11
WG1222447-4 MS		**L958466-1**						
Dichlofluanid			108		%		50-150	05-JAN-11
Pentachloronitrobenzene			77		%		50-150	05-JAN-11
Profenofos			52		%		50-150	05-JAN-11
Propazine			79		%		50-150	05-JAN-11
C-INORG-ORG-SK	**Soil**							
Batch R1705903								
WG1213832-1 DUP		**L958466-1**						
Inorganic Carbon		0.23	0.16	J	%	0.06	0.2	07-DEC-10
CaCO3 Equivalent		2.85	2.11	J	%	0.74	1.4	07-DEC-10
WG1213832-2 IRM		**0.4%IC**						
Inorganic Carbon			0.41		%		0.28-0.52	07-DEC-10
CaCO3 Equivalent			3.72		%		2.33-4.33	07-DEC-10
WG1213832-3 MB								
Inorganic Carbon			<0.10		%		0.1	07-DEC-10
CaCO3 Equivalent			<0.70		%		0.7	07-DEC-10

Quality Control Report

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Contact: MR.TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-TOT-LECO-SK	**Soil**							
Batch R1706404								
WG1213831-1 DUP		**L958466-2**						
Total Carbon by Combustion		24.1	23.5		%	2.5	10	06-DEC-10
WG1213831-2 IRM		**08-109_SOIL**						
Total Carbon by Combustion			1.6		%		1.1-1.7	06-DEC-10
WG1213831-3 MB								
Total Carbon by Combustion			<0.1		%		0.1	06-DEC-10
OCSCREEN-POP-ED	**Soil**							
Batch R1772563								
WG1218550-2 DUP		**L958466-1**						
alpha-BHC		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
beta-BHC		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
delta-BHC		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
gamma-BHC (Lindane)		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Heptachlor		1.42	1.10		ug/kg	25	50	20-DEC-10
Aldrin		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Heptachlor Epoxide		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Endosulfan I		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Dieldrin		0.57	0.50		ug/kg	13	50	20-DEC-10
4,4'-DDE		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Endrin		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Endosulfan II		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
4,4'-DDD		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Endosulfan Sulfate		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
4,4'-DDT		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Methoxychlor		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Endrin Ketone		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Endrin Aldehyde		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
alpha-Chlordane		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
gamma-Chlordane		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Hexachlorobenzene		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Trans-nonachlor		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
Mirex		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
2,4'-DDE		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
2,4'-DDT		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10

Quality Control Report

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Contact: MR.TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCSCREEN-POP-ED	**Soil**							
Batch R1772563								
WG1218550-2 DUP		**L958466-1**						
2,4'-DDD		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	20-DEC-10
WG1218550-3 LCS								
alpha-BHC			60		%		50-150	20-DEC-10
beta-BHC			72		%		50-150	20-DEC-10
delta-BHC			75		%		50-150	20-DEC-10
gamma-BHC (Lindane)			64		%		50-150	20-DEC-10
Heptachlor			75		%		50-150	20-DEC-10
Aldrin			60		%		50-150	20-DEC-10
Heptachlor Epoxide			71		%		50-150	20-DEC-10
Endosulfan I			73		%		50-150	20-DEC-10
Dieldrin			75		%		50-150	20-DEC-10
4,4'-DDE			77		%		50-150	20-DEC-10
Endrin			86		%		50-150	20-DEC-10
Endosulfan II			87		%		50-150	20-DEC-10
4,4'-DDD			91		%		50-150	20-DEC-10
Endosulfan Sulfate			92		%		50-150	20-DEC-10
4,4'-DDT			94		%		50-150	20-DEC-10
Methoxychlor			105		%		50-150	20-DEC-10
Endrin Ketone			84		%		50-150	20-DEC-10
Endrin Aldehyde			69		%		50-150	20-DEC-10
alpha-Chlordane			72		%		50-150	20-DEC-10
gamma-Chlordane			70		%		50-150	20-DEC-10
Hexachlorobenzene			55		%		50-150	20-DEC-10
Trans-nonachlor			74		%		50-150	20-DEC-10
Mirex			76		%		50-150	20-DEC-10
2,4'-DDE			73		%		50-150	20-DEC-10
2,4'-DDT			89		%		50-150	20-DEC-10
2,4'-DDD			93		%		50-150	20-DEC-10
WG1218550-1 MB								
alpha-BHC			<0.10		ug/kg		0.1	20-DEC-10
beta-BHC			<0.10		ug/kg		0.1	20-DEC-10
delta-BHC			<0.10		ug/kg		0.1	20-DEC-10
gamma-BHC (Lindane)			<0.10		ug/kg		0.1	20-DEC-10
Heptachlor			<0.10		ug/kg		0.1	20-DEC-10

Quality Control Report

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Contact: MR.TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCSCREEN-POP-ED	**Soil**							
Batch R1772563								
WG1218550-1 MB								
Aldrin			<0.10		ug/kg		0.1	20-DEC-10
Heptachlor Epoxide			<0.10		ug/kg		0.1	20-DEC-10
Endosulfan I			<0.10		ug/kg		0.1	20-DEC-10
Dieldrin			<0.10		ug/kg		0.1	20-DEC-10
4,4'-DDE			<0.10		ug/kg		0.1	20-DEC-10
Endrin			<0.10		ug/kg		0.1	20-DEC-10
Endosulfan II			<0.10		ug/kg		0.1	20-DEC-10
4,4'-DDD			<0.10		ug/kg		0.1	20-DEC-10
Endosulfan Sulfate			<0.10		ug/kg		0.1	20-DEC-10
4,4'-DDT			<0.10		ug/kg		0.1	20-DEC-10
Methoxychlor			<0.10		ug/kg		0.1	20-DEC-10
Endrin Ketone			<0.10		ug/kg		0.1	20-DEC-10
Endrin Aldehyde			<0.10		ug/kg		0.1	20-DEC-10
alpha-Chlordane			<0.10		ug/kg		0.1	20-DEC-10
gamma-Chlordane			<0.10		ug/kg		0.1	20-DEC-10
Hexachlorobenzene			<0.10		ug/kg		0.1	20-DEC-10
Trans-nonachlor			<0.10		ug/kg		0.1	20-DEC-10
Mirex			<0.10		ug/kg		0.1	20-DEC-10
2,4'-DDE			<0.10		ug/kg		0.1	20-DEC-10
2,4'-DDT			<0.10		ug/kg		0.1	20-DEC-10
2,4'-DDD			<0.10		ug/kg		0.1	20-DEC-10
PREP-MOISTURE-ED	**Soil**							
Batch R1682003								
WG1210988-1 DUP		**L958500-1**						
% Moisture		20.2	20.2		%	0.065	20	01-DEC-10
PSA-3-SK	**Soil**							
Batch R1722643								
WG1213829-1 DUP		**L931029-10**						
% Sand (2.0mm - 0.05mm)		2.42	0.86	J	%	1.56	10	10-DEC-10
% Silt (0.05mm - 2um)		68.1	69.0	J	%	0.90	10	10-DEC-10
% Clay (<2um)		29.5	30.2	J	%	0.65	10	10-DEC-10
WG1213829-2 IRM		**FARM2009**						
% Sand (2.0mm - 0.05mm)			51.6		%		43-63	10-DEC-10

Quality Control Report

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Contact: MR.TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PSA-3-SK	**Soil**							
Batch R1722643								
WG1213829-2 IRM		**FARM2009**						
% Silt (0.05mm - 2um)			35.0		%		22-42	10-DEC-10
% Clay (<2um)			13.4		%		5-25	10-DEC-10

Quality Control Report

Legend:

Limit	99% Confidence Interval (Laboratory Control Limits)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
LCS-H	Lab Control Sample recovery was above ALS DQO. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of 1

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Conestoga-Rovers + Associates	☒ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Mr. Troy Small	☒ PDF ☐ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	466 Hodgson Rd. Fredericton, NB E3C 2G5	Email 1:	tSmall@craworld.com	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
Phone:	(506) 458-1248 Fax: (506) 462-7646	Email 2:		○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Invoice To	Same as Report ? ☒ Yes ☐ No	Email 3:		**Analysis Request**
Hardcopy of Invoice with Report?	☒ Yes ☐ No	**Client / Project Information**		Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:		Job #:	072004	
Contact:		PO / AFE:		
Address:		LSD:		
Phone:	Fax:	Quote #:	Q25601	
Lab Work Order # (lab use only):	L958466	ALS Contact:	Erin Beaudin	Sampler: Peter Dillingham

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	OC SCREEN-AP-ED	GRAIN SIZE ANALYSIS BY Hydrometer	TOTAL ORGANIC CARBON	% MOISTURE	SPECIAL Request-EX	Number of Containers
	SED-9 (Oxley's Pond)	24-11-10	14:30	SEDIMENT	X	X	X	X	X	2
	SED-19 (Pond J)	24-11-10	12:30	SEDIMENT	X	X	X	X	X	2
	SED-20 (Pond K)	24-11-10	10:30	SEDIMENT	X	X	X	X	X	2
	BACKGROUND (BACKGROUND POND)	24-11-10	16:00	SEDIMENT	X	X	X	X	X	2

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

AoP Organo-Chlorine Screen / SPECIAL Request-EX is for DICHLOFLUANID, PENTACHLORONITROBENZENE, PROFENOFOS AND PROPAZINE IN SEDIMENT - Refer to ALS Quote Q25601

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Peter Dillingham	29-11-10	8:00 AM	Q	30 Nov 10	10:00	6-7 °C				

GENF 18.01 Front

CONESTOGA ROVERS & ASSOCIATES (CRA)
ATTN: TROY SMALL
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Phone: 506-458-1248

Date Received: 10-DEC-10
Report Date: 08-FEB-11 12:48 (MT)
Version: FINAL

Certificate of Analysis

Lab Work Order #: L961808
Project P.O. #: NOT SUBMITTED
Job Reference: 072004
Legal Site Desc:
C of C Numbers:

Comments:

21-JAN-11: Revised for Pentachloronitrobenzene, Profenofos and Propazine data.

08-FEB-11: Dichlofluanid analysis not possible due to matrix complications. Standard industry practices were attempted to resolve this issue, with no success.

Brent Finnestad
Account Manager

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-1 OXLEY'S POND-FILLET ANALYSIS #1							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 09:30							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	3.0		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	1.37		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	3.95		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	0.81		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	0.42		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.44		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	1.12		0.10	ug/kg		24-DEC-10	R1783248
Mirex	0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	51		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	62		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	64		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.020	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.020	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.020	mg/kg		10-JAN-11	R1834765
L961808-2 OXLEY'S POND-FILLET ANALYSIS #2							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 09:40							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	0.6		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.54		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.78		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-2 OXLEY'S POND-FILLET ANALYSIS #2							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 09:40							
Matrix: FISH							
POP Organo-chlorine screen							
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	0.33		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	0.30		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	0.62		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.14		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	0.16		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	43		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	56		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	98		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-3 OXLEY'S POND-FILLET ANALYSIS #3							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 09:50							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	0.3		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.11		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.54		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	0.25		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-3 OXLEY'S POND-FILLET ANALYSIS #3							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 09:50							
Matrix: FISH							
POP Organo-chlorine screen							
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	38		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	63		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	78		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-4 OXLEY'S POND-FILLET ANALYSIS #4							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 10:00							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.0		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.81		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	5.75		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	0.89		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	0.74		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	0.45		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.20	ABL	0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	1.54		0.10	ug/kg		24-DEC-10	R1783248
Mirex	0.13	ABL	0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	0.10	ABL	0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	43		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	58		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	91		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-5 OXLEY'S POND-FILLET ANALYSIS #5							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 10:10							
Matrix: FISH							
Miscellaneous Parameters							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-5 OXLEY'S POND-FILLET ANALYSIS #5							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 10:10							
Matrix: FISH							
Lipid Content	0.9		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	1.70		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	1.82		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	0.45		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	0.46		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	0.17		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.12		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	1.06		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	41		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	59		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	87		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-6 OXLEY'S POND-WHOLE FISH #6							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 10:20							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	2.9		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	0.11		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	0.28	ABL	0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	11.1		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	1.76		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-6 OXLEY'S POND-WHOLE FISH #6							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 10:20							
Matrix: FISH							
POP Organo-chlorine screen							
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	0.74		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	33		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	48	G	50-150	%		24-DEC-10	R1783248
Note: The decachlorobiphenyl was 2% out of DQL. This does not have much impact on data quality.							
Surrogate: Treflan d14 (surr)	87		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-7 OXLEY'S POND-WHOLE FISH #7							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 10:30							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.0		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	3.35		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	10.4		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	0.32		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	0.75		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	0.46		0.10	ug/kg		24-DEC-10	R1783248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-7 OXLEY'S POND-WHOLE FISH #7							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 10:30							
Matrix: FISH							
POP Organo-chlorine screen							
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	40		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	60		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	110		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-8 OXLEY'S POND-WHOLE FISH #8							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 10:40							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	5.0		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	0.14		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	5.75		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	2.42		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	0.78		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	0.53		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	0.51		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.32		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	2.00		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	37		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	57		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	106		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-9 OXLEY'S POND-COMPOSITE SAMPLE #9							
Sampled By: PETER GILLINGHAM on 08-DEC-10 @ 10:50							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	3.9		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	0.22		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	3.16		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	2.73		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	0.88		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	0.61		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	0.18		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.29		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	0.76		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	42		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	57		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	98		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-10 POND J-FILLET ANALYSIS #1							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:00							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	0.6		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.12		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.29		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-10 POND J-FILLET ANALYSIS #1							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:00							
Matrix: FISH							
POP Organo-chlorine screen							
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	0.29	ABL	0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	42		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	63		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	105		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-11 POND J-FILLET ANALYSIS #2							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:15							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	0.8		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.11	ABL	0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.81		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	0.17		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-11 POND J-FILLET ANALYSIS #2							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:15							
Matrix: FISH							
POP Organo-chlorine screen							
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	48		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	71		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	105		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-12 POND J-FILLET ANALYSIS #3							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:25							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.3		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.20		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.39		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.12		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	0.14		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	41		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	63		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	110		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-13 POND J-FILLET ANALYSIS #4							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:35							
Matrix: FISH							
Miscellaneous Parameters							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-13 POND J-FILLET ANALYSIS #4							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:35							
Matrix: FISH							
Lipid Content	1.5		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.16		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.33		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.10		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	42		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	61		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	98		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-14 POND J-FILLET ANALYSIS #5							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:45							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.7		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.21		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.39		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-14 POND J-FILLET ANALYSIS #5							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:45							
Matrix: FISH							
POP Organo-chlorine screen							
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	0.35		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.10		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	48		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	66		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14 (surr)	91		50-150	%		10-JAN-11	R1834765
PCNB	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Profenofos	<0.020		0.02	mg/kg		10-JAN-11	R1834765
Propazine	<0.020		0.02	mg/kg		10-JAN-11	R1834765
L961808-15 POND J-WHOLE FISH #6							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:55							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.3		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.15		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.40		0.10	ug/kg		24-DEC-10	R1783248
Endrin	0.11	ABL	0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.14		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-15 POND J-WHOLE FISH #6							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 10:55							
Matrix: FISH							
POP Organo-chlorine screen							
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	49		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	68		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14	57		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-16 POND J-WHOLE FISH #7							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 11:05							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	2.1		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.16		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.47		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.19		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	0.14	ABL	0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	35		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	54		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14	60		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-17 POND J-WHOLE FISH #8							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 11:15							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.8		0.1	%	20-DEC-10	23-DEC-10	R1774163

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-17 POND J-WHOLE FISH #8							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 11:15							
Matrix: FISH							
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.21		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.31		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	0.45		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	42		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	67		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14	82		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-18 POND J-WHOLE FISH #9							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 11:30							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.9		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.24		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.26		0.10	ug/kg		24-DEC-10	R1783248
Endrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-18 POND J-WHOLE FISH #9							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 11:30							
Matrix: FISH							
POP Organo-chlorine screen							
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	0.47		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.11		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Mirex	0.12		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	45		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	77		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14	72		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.02	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.02	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.02	mg/kg		16-JAN-11	R1847103
L961808-19 POND J-COMPOSITE SAMPLE #10							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 11:40							
Matrix: MINNOWS							
Miscellaneous Parameters							
Lipid Content	3.8		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	0.15		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.43		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	0.45		0.10	ug/kg		24-DEC-10	R1783248
Endrin	0.15		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.27		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	0.17		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-19 POND J-COMPOSITE SAMPLE #10							
Sampled By: PETER GILLINGHAM on 06-DEC-10 @ 11:40							
Matrix: MINNOWS							
POP Organo-chlorine screen							
Surrogate: Tetrachloro-m-xylene	42		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	69		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14	70		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-20 POND K-FILLET ANALYSIS #1							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 09:00							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.5		0.1	%	20-DEC-10	23-DEC-10	R1774163
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
beta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
delta-BHC	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Aldrin	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Heptachlor Epoxide	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan I	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Dieldrin	0.25		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDE	1.04		0.10	ug/kg		24-DEC-10	R1783248
Endrin	0.23		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan II	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endosulfan Sulfate	<0.10		0.10	ug/kg		24-DEC-10	R1783248
4,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Methoxychlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Ketone	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Endrin Aldehyde	<0.10		0.10	ug/kg		24-DEC-10	R1783248
alpha-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
gamma-Chlordane	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Hexachlorobenzene	0.13		0.10	ug/kg		24-DEC-10	R1783248
Trans-nonachlor	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Mirex	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDE	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDD	<0.10		0.10	ug/kg		24-DEC-10	R1783248
2,4'-DDT	<0.10		0.10	ug/kg		24-DEC-10	R1783248
Surrogate: Tetrachloro-m-xylene	44		30-130	%		24-DEC-10	R1783248
Surrogate: Decachlorobiphenyl	71		50-150	%		24-DEC-10	R1783248
Surrogate: Treflan d14	76		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-21 POND K-FILLET ANALYSIS #2							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 09:15							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.3		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-21 POND K-FILLET ANALYSIS #2							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 09:15							
Matrix: FISH							
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.14		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.53		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	0.42		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	32		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	61		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	86		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-22 POND K-FILLET ANALYSIS #3							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 09:25							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.0		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.18		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.37		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-22 POND K-FILLET ANALYSIS #3							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 09:25							
Matrix: FISH							
POP Organo-chlorine screen							
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	0.34		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	0.11		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	42		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	61		50-150	%		28-DEC-10	R1792423
L961808-23 POND K-FILLET ANALYSIS #4							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 09:40							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.1		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.27		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	47		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	75		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	77		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-23 POND K-FILLET ANALYSIS #4							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 09:40							
Matrix: FISH							
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-24 POND K-FILLET ANALYSIS #5							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 09:50							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.2		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.18		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.61		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	0.18		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	42		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	72		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	75		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-25 POND K-WHOLE FISH #6							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 10:05							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.6		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-25 POND K-WHOLE FISH #6							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 10:05							
Matrix: FISH							
POP Organo-chlorine screen							
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.14		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	0.27		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	44		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	71		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	87		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-26 POND K-WHOLE FISH #7							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 10:15							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.3		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.16		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.34		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-26 POND K-WHOLE FISH #7							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 10:15							
Matrix: FISH							
POP Organo-chlorine screen							
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	40		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	75		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	76		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-27 POND K-WHOLE FISH #8							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 10:25							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.4		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.17		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.25		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	46		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	69		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	90		50-150	%		16-JAN-11	R1847103
PCNB	<0.020		0.020	mg/kg		16-JAN-11	R1847103
Profenofos	<0.020		0.020	mg/kg		16-JAN-11	R1847103

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-27 POND K-WHOLE FISH #8							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 10:25							
Matrix: FISH							
Propazine	<0.020		0.020	mg/kg		16-JAN-11	R1847103
L961808-28 POND K-WHOLE FISH #9							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 10:40							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.1		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.21		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	35		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	65		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	70		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643
L961808-29 POND K-COMPOSITE SAMPLE #10							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 10:55							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	4.7		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	0.13		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-29 POND K-COMPOSITE SAMPLE #10							
Sampled By: PETER GILLINGHAM on 03-DEC-10 @ 10:55							
Matrix: FISH							
POP Organo-chlorine screen							
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.34		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.32		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	0.24		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	40		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	65		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	76		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643
L961808-30 REF POND-FILLET ANALYSIS #1							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 09:30							
Matrix: MINNOWS							
Miscellaneous Parameters							
Lipid Content	2.0		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.16		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.72		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-30 REF POND-FILLET ANALYSIS #1							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 09:30							
Matrix: MINNOWS							
POP Organo-chlorine screen							
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	45		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	64		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	94		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643
L961808-31 REF POND-FILLET ANALYSIS #2							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 09:40							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	2.6		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.27		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.66		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	0.11		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	56		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	73		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	73		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-31 REF POND-FILLET ANALYSIS #2							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 09:40							
Matrix: FISH							
L961808-32 REF POND-FILLET ANALYSIS #3							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 09:50							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	1.2		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.74		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	38		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	66		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	84		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643
L961808-33 REF POND-FILLET ANALYSIS #4							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 10:05							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	2.2		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS LABORATORY GROUP ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-33 REF POND-FILLET ANALYSIS #4							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 10:05							
Matrix: FISH							
POP Organo-chlorine screen							
Dieldrin	0.25		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.24		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	55		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	75		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	74		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643
L961808-34 REF POND-FILLET ANALYSIS #5							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 10:15							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	3.4		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.32		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.41		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	0.13		0.10	ug/kg		28-DEC-10	R1792423

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-34 REF POND-FILLET ANALYSIS #5							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 10:15							
Matrix: FISH							
POP Organo-chlorine screen							
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	46		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	68		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	87		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643
L961808-35 REF POND-WHOLE FISH #6							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 10:25							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	3.2		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.23		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.21		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	0.13		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	0.23		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	48		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	66		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	77		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-36 REF POND-WHOLE FISH #7							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 10:40							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	2.8		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.19		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.19		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	48		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	74		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	75		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643
L961808-37 REF POND-WHOLE FISH #8							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 10:55							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	2.2		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.17		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.66		0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-37 REF POND-WHOLE FISH #8							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 10:55							
Matrix: FISH							
POP Organo-chlorine screen							
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	51		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	68		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	86		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643
L961808-38 REF POND-WHOLE FISH #9							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 11:10							
Matrix: FISH							
Miscellaneous Parameters							
Lipid Content	3.2		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.35		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.20		0.10	ug/kg		28-DEC-10	R1792423
Endrin	0.21	ABL	0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	0.12		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

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Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L961808-38 REF POND-WHOLE FISH #9							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 11:10							
Matrix: FISH							
POP Organo-chlorine screen							
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	45		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	66		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	80		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643
L961808-39 REF POND-COMPOSITE SAMPLE #10							
Sampled By: PETER GILLINGHAM on 01-DEC-10 @ 11:25							
Matrix: MINNOWS							
Miscellaneous Parameters							
Lipid Content	4.6		0.1	%	20-DEC-10	29-DEC-10	R1790943
POP Organo-chlorine screen							
alpha-BHC	0.18		0.10	ug/kg		28-DEC-10	R1792423
beta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
delta-BHC	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-BHC (Lindane)	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Aldrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Heptachlor Epoxide	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan I	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Dieldrin	0.42		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDE	0.13	ABL	0.10	ug/kg		28-DEC-10	R1792423
Endrin	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan II	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endosulfan Sulfate	<0.10		0.10	ug/kg		28-DEC-10	R1792423
4,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Methoxychlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Ketone	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Endrin Aldehyde	<0.10		0.10	ug/kg		28-DEC-10	R1792423
alpha-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
gamma-Chlordane	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Hexachlorobenzene	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Trans-nonachlor	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Mirex	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDE	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDD	<0.10		0.10	ug/kg		28-DEC-10	R1792423
2,4'-DDT	<0.10		0.10	ug/kg		28-DEC-10	R1792423
Surrogate: Tetrachloro-m-xylene	55		30-130	%		28-DEC-10	R1792423
Surrogate: Decachlorobiphenyl	69		50-150	%		28-DEC-10	R1792423
Surrogate: Treflan d14	77		50-150	%		17-JAN-11	R1847643
PCNB	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Profenofos	<0.020		0.020	mg/kg		17-JAN-11	R1847643
Propazine	<0.020		0.020	mg/kg		17-JAN-11	R1847643

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Endrin Aldehyde	G	L961808-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Comments:	Endrin aldehyde and alpha-BHC were 1% out of limits. This does not have much impact on data quality.		
Matrix Spike	alpha-BHC	G	L961808-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Comments:	Endrin aldehyde and alpha-BHC were 1% out of limits. This does not have much impact on data quality.		

Sample Parameter Qualifier Key:

Qualifier	Description
ABL	Approximate Result: May Be Biased Low
G	QC result did not meet ALS DQO. Refer to narrative comments for further information.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
LIPID-ED	Tissue	Lipid Content	-Gravimetric
OCSCREEN-POP-ED	Biota	POP Organo-chlorine screen	EPA 8081 GC/ECD

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
ED	ALS LABORATORY GROUP - EDMONTON, ALBERTA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L961808 Report Date: 08-FEB-11

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Contact: TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
LIPID-ED	**Tissue**							
Batch R1774163								
WG1221527-1 DUP		**L961808-7**						
Lipid Content		1.0	1.3		%	26		23-DEC-10
Batch R1790943								
WG1222818-1 DUP		**L961808-32**						
Lipid Content		1.2	1.3		%	8.0		29-DEC-10
OCSCREEN-POP-ED	**Biota**							
Batch R1783248								
WG1219091-2 DUP		**L961808-7**						
alpha-BHC		<0.10	<0.10	RPD-NA	ug/kg	N/A	74	24-DEC-10
beta-BHC		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
delta-BHC		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
gamma-BHC (Lindane)		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
Heptachlor		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
Aldrin		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
Heptachlor Epoxide		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
Endosulfan I		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
Dieldrin		3.35	3.75		ug/kg	11	74	24-DEC-10
4,4'-DDE		10.4	11.9		ug/kg	13	50	24-DEC-10
Endrin		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
Endosulfan II		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
4,4'-DDD		0.32	0.29		ug/kg	11	74	24-DEC-10
Endosulfan Sulfate		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
4,4'-DDT		0.75	0.74		ug/kg	1.6	74	24-DEC-10
Methoxychlor		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
Endrin Ketone		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
Endrin Aldehyde		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
alpha-Chlordane		<0.10	<0.10	RPD-NA	ug/kg	N/A	74	24-DEC-10
gamma-Chlordane		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
Hexachlorobenzene		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
Trans-nonachlor		0.46	0.51		ug/kg	11	50	24-DEC-10
Mirex		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
2,4'-DDE		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
2,4'-DDD		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10

Quality Control Report

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Contact: TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCSCREEN-POP-ED	**Biota**							
Batch R1783248								
WG1219091-2 DUP		**L961808-7**						
2,4'-DDT		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	24-DEC-10
WG1219091-3 LCS								
alpha-BHC			47		%		12-108	24-DEC-10
beta-BHC			68		%		22-105	24-DEC-10
delta-BHC			72		%		39-101	24-DEC-10
gamma-BHC (Lindane)			51		%		23-102	24-DEC-10
Heptachlor			64		%		16-113	24-DEC-10
Aldrin			52		%		40-140	24-DEC-10
Heptachlor Epoxide			70		%		33-108	24-DEC-10
Endosulfan I			71		%		26-124	24-DEC-10
Dieldrin			75		%		32-120	24-DEC-10
4,4'-DDE			77		%		47-110	24-DEC-10
Endrin			90		%		8-141	24-DEC-10
Endosulfan II			70		%		20-119	24-DEC-10
4,4'-DDD			90		%		44-121	24-DEC-10
Endosulfan Sulfate			78		%		23-116	24-DEC-10
4,4'-DDT			93		%		28-133	24-DEC-10
Methoxychlor			106		%		20-152	24-DEC-10
Endrin Ketone			80		%		20-125	24-DEC-10
Endrin Aldehyde			58		%		5-97	24-DEC-10
alpha-Chlordane			71		%		50-110	24-DEC-10
gamma-Chlordane			71		%		50-130	24-DEC-10
Hexachlorobenzene			42		%		30-120	24-DEC-10
Trans-nonachlor			73		%		36-116	24-DEC-10
Mirex			82		%		50-150	24-DEC-10
2,4'-DDE			73		%		50-150	24-DEC-10
2,4'-DDD			93		%		50-150	24-DEC-10
2,4'-DDT			94		%		50-150	24-DEC-10
WG1219091-1 MB								
alpha-BHC			<0.10		ug/kg		0.1	24-DEC-10
beta-BHC			<0.10		ug/kg		0.1	24-DEC-10
delta-BHC			<0.10		ug/kg		0.1	24-DEC-10
gamma-BHC (Lindane)			<0.10		ug/kg		0.1	24-DEC-10
Heptachlor			<0.10		ug/kg		0.1	24-DEC-10

Quality Control Report

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Contact: TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCSCREEN-POP-ED	**Biota**							
Batch R1783248								
WG1219091-1 MB								
Aldrin			<0.10		ug/kg		0.1	24-DEC-10
Heptachlor Epoxide			<0.10		ug/kg		0.1	24-DEC-10
Endosulfan I			<0.10		ug/kg		0.1	24-DEC-10
Dieldrin			<0.10		ug/kg		0.1	24-DEC-10
4,4'-DDE			<0.10		ug/kg		0.1	24-DEC-10
Endrin			<0.10		ug/kg		0.1	24-DEC-10
Endosulfan II			<0.10		ug/kg		0.1	24-DEC-10
4,4'-DDD			<0.10		ug/kg		0.1	24-DEC-10
Endosulfan Sulfate			<0.10		ug/kg		0.1	24-DEC-10
4,4'-DDT			<0.10		ug/kg		0.1	24-DEC-10
Methoxychlor			<0.10		ug/kg		0.1	24-DEC-10
Endrin Ketone			<0.10		ug/kg		0.1	24-DEC-10
Endrin Aldehyde			<0.10		ug/kg		0.1	24-DEC-10
alpha-Chlordane			<0.10		ug/kg		0.1	24-DEC-10
gamma-Chlordane			<0.10		ug/kg		0.1	24-DEC-10
Hexachlorobenzene			<0.10		ug/kg		0.1	24-DEC-10
Trans-nonachlor			<0.10		ug/kg		0.1	24-DEC-10
Mirex			<0.10		ug/kg		0.1	24-DEC-10
2,4'-DDE			<0.10		ug/kg		0.1	24-DEC-10
2,4'-DDD			<0.10		ug/kg		0.1	24-DEC-10
2,4'-DDT			<0.10		ug/kg		0.1	24-DEC-10
WG1219091-4 MS		**L961808-18**						
alpha-BHC			49	G	%		50-150	24-DEC-10
beta-BHC			65		%		50-150	24-DEC-10
delta-BHC			63		%		50-150	24-DEC-10
gamma-BHC (Lindane)			51		%		50-150	24-DEC-10
Heptachlor			74		%		50-150	24-DEC-10
Aldrin			57		%		50-150	24-DEC-10
Heptachlor Epoxide			67		%		50-150	24-DEC-10
Endosulfan I			66		%		50-150	24-DEC-10
Dieldrin			65		%		50-150	24-DEC-10
4,4'-DDE			68		%		50-150	24-DEC-10
Endrin			86		%		50-150	24-DEC-10
Endosulfan II			74		%		50-150	24-DEC-10

Quality Control Report

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Contact: TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCSCREEN-POP-ED	**Biota**							
Batch R1783248								
WG1219091-4 MS		**L961808-18**						
4,4'-DDD			81		%		50-150	24-DEC-10
Endosulfan Sulfate			82		%		50-150	24-DEC-10
4,4'-DDT			89		%		50-150	24-DEC-10
Methoxychlor			102		%		50-150	24-DEC-10
Endrin Ketone			78		%		50-150	24-DEC-10
Endrin Aldehyde			49	G	%		50-150	24-DEC-10
alpha-Chlordane			65		%		50-150	24-DEC-10
gamma-Chlordane			64		%		50-150	24-DEC-10
Hexachlorobenzene			50		%		50-150	24-DEC-10
Trans-nonachlor			67		%		50-150	24-DEC-10
Mirex			69		%		50-150	24-DEC-10
2,4'-DDE			61		%		50-150	24-DEC-10
2,4'-DDD			78		%		50-150	24-DEC-10
2,4'-DDT			82		%		50-150	24-DEC-10
COMMENTS: Endrin aldehyde and alpha-BHC were 1% out of limits. This does not have much impact on data quality.								
Batch R1792423								
WG1220481-2 DUP		**L961808-32**						
alpha-BHC		<0.10	<0.10	RPD-NA	ug/kg	N/A	74	28-DEC-10
beta-BHC		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
delta-BHC		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
gamma-BHC (Lindane)		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
Heptachlor		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
Aldrin		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
Heptachlor Epoxide		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
Endosulfan I		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
Dieldrin		<0.10	<0.10	RPD-NA	ug/kg	N/A	74	28-DEC-10
4,4'-DDE		0.74	0.75		ug/kg	1.2	50	28-DEC-10
Endrin		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
Endosulfan II		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
4,4'-DDD		<0.10	<0.10	RPD-NA	ug/kg	N/A	74	28-DEC-10
Endosulfan Sulfate		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
4,4'-DDT		<0.10	<0.10	RPD-NA	ug/kg	N/A	74	28-DEC-10
Methoxychlor		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10

Quality Control Report

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Contact: TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCSCREEN-POP-ED	**Biota**							
Batch R1792423								
WG1220481-2 DUP		**L961808-32**						
Endrin Ketone		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
Endrin Aldehyde		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
alpha-Chlordane		<0.10	<0.10	RPD-NA	ug/kg	N/A	74	28-DEC-10
gamma-Chlordane		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
Hexachlorobenzene		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
Trans-nonachlor		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
Mirex		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
2,4'-DDE		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
2,4'-DDD		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
2,4'-DDT		<0.10	<0.10	RPD-NA	ug/kg	N/A	50	28-DEC-10
WG1220481-3 LCS								
alpha-BHC			53		%		12-108	28-DEC-10
beta-BHC			90		%		22-105	28-DEC-10
delta-BHC			87		%		39-101	28-DEC-10
gamma-BHC (Lindane)			62		%		23-102	28-DEC-10
Heptachlor			75		%		16-113	28-DEC-10
Aldrin			66		%		40-140	28-DEC-10
Heptachlor Epoxide			84		%		33-108	28-DEC-10
Endosulfan I			89		%		26-124	28-DEC-10
Dieldrin			92		%		32-120	28-DEC-10
4,4'-DDE			102		%		47-110	28-DEC-10
Endrin			63		%		8-141	28-DEC-10
Endosulfan II			61		%		20-119	28-DEC-10
4,4'-DDD			70		%		44-121	28-DEC-10
Endosulfan Sulfate			79		%		23-116	28-DEC-10
4,4'-DDT			99		%		28-133	28-DEC-10
Methoxychlor			94		%		20-152	28-DEC-10
Endrin Ketone			64		%		20-125	28-DEC-10
Endrin Aldehyde			46		%		5-97	28-DEC-10
alpha-Chlordane			96		%		50-110	28-DEC-10
gamma-Chlordane			90		%		50-130	28-DEC-10
Hexachlorobenzene			47		%		30-120	28-DEC-10
Trans-nonachlor			100		%		36-116	28-DEC-10

Quality Control Report

Client: CONESTOGA ROVERS & ASSOCIATES (CRA)
466 HODGSON ROAD
FREDERICTON NB E3C 2G5
Contact: TROY SMALL

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
OCSCREEN-POP-ED	**Biota**							
Batch R1792423								
WG1220481-3 LCS								
Mirex			97		%		50-150	28-DEC-10
2,4'-DDE			93		%		50-150	28-DEC-10
2,4'-DDD			70		%		50-150	28-DEC-10
2,4'-DDT			81		%		50-150	28-DEC-10
WG1220481-1 MB								
alpha-BHC			<0.10		ug/kg		0.1	28-DEC-10
beta-BHC			<0.10		ug/kg		0.1	28-DEC-10
delta-BHC			<0.10		ug/kg		0.1	28-DEC-10
gamma-BHC (Lindane)			<0.10		ug/kg		0.1	28-DEC-10
Heptachlor			<0.10		ug/kg		0.1	28-DEC-10
Aldrin			<0.10		ug/kg		0.1	28-DEC-10
Heptachlor Epoxide			<0.10		ug/kg		0.1	28-DEC-10
Endosulfan I			<0.10		ug/kg		0.1	28-DEC-10
Dieldrin			<0.10		ug/kg		0.1	28-DEC-10
4,4'-DDE			<0.10		ug/kg		0.1	28-DEC-10
Endrin			<0.10		ug/kg		0.1	28-DEC-10
Endosulfan II			<0.10		ug/kg		0.1	28-DEC-10
4,4'-DDD			<0.10		ug/kg		0.1	28-DEC-10
Endosulfan Sulfate			<0.10		ug/kg		0.1	28-DEC-10
4,4'-DDT			<0.10		ug/kg		0.1	28-DEC-10
Methoxychlor			<0.10		ug/kg		0.1	28-DEC-10
Endrin Ketone			<0.10		ug/kg		0.1	28-DEC-10
Endrin Aldehyde			<0.10		ug/kg		0.1	28-DEC-10
alpha-Chlordane			<0.10		ug/kg		0.1	28-DEC-10
gamma-Chlordane			<0.10		ug/kg		0.1	28-DEC-10
Hexachlorobenzene			<0.10		ug/kg		0.1	28-DEC-10
Trans-nonachlor			<0.10		ug/kg		0.1	28-DEC-10
Mirex			<0.10		ug/kg		0.1	28-DEC-10
2,4'-DDE			<0.10		ug/kg		0.1	28-DEC-10
2,4'-DDD			<0.10		ug/kg		0.1	28-DEC-10
2,4'-DDT			<0.10		ug/kg		0.1	28-DEC-10

Quality Control Report

Legend:

Limit	99% Confidence Interval (Laboratory Control Limits)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
G	QC result did not meet ALS DQO. Refer to narrative comments for further information.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

Chain of Custody / Analytical Request Form

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

COC # _____

Page 1 of 4

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	CONESTOGA-ROVERS + ASSOCIATES	☒ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Mr. Troy Smallc	☒ PDF ☐ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	466 Hodgson Road. Fredericton, NB	Email 1:		○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
		Email 2:		○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	(506) 458-1248 Fax: (506) 462-7646	Email 3:		
Invoice To	Same as Report ? ☒ Yes ☐ No	**Client / Project Information**		**Analysis Request**
Hardcopy of Invoice with Report?	☒ Yes ☐ No	Job #:	072004	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q25601	

Lab Work Order # (lab use only)	L961608	ALS Contact:	Erin Beaudin	Sampler:	Peter Billingham

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	OC Screen-AP-ED	1,1,1,2-ED	Special Request-R	Number of Containers
	OXLEY'S POND - FILLET ANALYSIS #1	08-12-10	9:30	FISH	X	X	X	1
	OXLEY'S POND - FILLET ANALYSIS #2	08-12-10	9:40	FISH	X	X	X	1
	OXLEY'S POND - FILLET ANALYSIS #3	08-12-10	9:50	FISH	X	X	X	1
	OXLEY'S POND - FILLET ANALYSIS #4	08-12-10	10:00	FISH	X	X	X	1
	OXLEY'S POND - FILLET ANALYSIS #5	08-12-10	10:10	FISH	X	X	X	1
	OXLEY'S POND - WHOLE FISH #6	08-12-10	10:20	FISH	X	X	X	1
	OXLEY'S POND - WHOLE FISH #7	08-12-10	10:30	FISH	X	X	X	1
	OXLEY'S POND - WHOLE FISH #8	08-12-10	10:40	FISH	X	X	X	1
	OXLEY'S POND - COMPOSITE SAMPLE #9	08-12-10	10:50	MINNOWS.	X	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

POP Organo-Chlorine Screen / SPECIAL REQ-R+D-ED IS FOR DICHLOFLUANID, PENTACHLORONITROBENZENE, PROFENOFOS AND PROPAZINE IN FISH TISSUE - REFER TO ALS

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as provided on a separate Excel tab.

QUOTE Q25601

Also provided on another Excel tab are the ALS location addresses, phone numbers and sample container / preservation / holding time table for common analyses.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Peter Billingham	09-12-10	8:00 AM	KBL	10 Dec 10	9:21	- °C				

Peter Billingham

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COC # _____

Report To		Report Format / Distribution		Service Requested (Rush for routine analysis subject to availability)
Company:	Conestoga-Rovers + Associates	☒ Standard ☐ Other		◉ Regular (Standard Turnaround Times - Business Days)
Contact:	Mr. Troy Small	☒ PDF ☐ Excel ☐ Digital ☐ Fax		○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address:	466 Hodgson Road. Fredericton, NB	Email 1:		○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
		Email 2:		○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	(506) 458-1248 Fax: (506) 462-7646	Email 3:		

Invoice To	Same as Report ? ☒ Yes ☐ No	Client / Project Information	
Hardcopy of Invoice with Report?	☒ Yes ☐ No	Job #:	072011
Company:		PO / AFE:	
Contact:		LSD:	
Address:			
Phone:	Fax:	Quote #:	Q25601
Lab Work Order # (lab use only)		ALS Contact:	Erin Beaudin
		Sampler:	Peter Lillingham

Analysis Request

Please indicate below Filtered, Preserved or both (F, P, F/P)

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	OC SCREEN-R&D-ED	LIPIDS - ED	SPECIAL REQUEST-EX	Number of Containers
	POND J - FILLET ANALYSIS #1	06-12-10	10:00	FISH	X	X	X	1
	POND J - FILLET ANALYSIS #2	06-12-10	10:15	FISH	X	X	X	1
	POND J - FILLET ANALYSIS #3	06-12-10	10:25	FISH	X	X	X	1
	POND J - FILLET ANALYSIS #4	06-12-10	10:35	FISH	X	X	X	1
	POND J - FILLET ANALYSIS #5	06-12-10	10:45	FISH	X	X	X	1
	POND J - WHOLE FISH #6	06-12-10	10:55	FISH	X	X	X	1
	POND J - WHOLE FISH #7	06-12-10	11:05	FISH	X	X	X	1
	POND J - WHOLE FISH #8	06-12-10	11:15	FISH	X	X	X	1
	POND J - WHOLE FISH #9	06-12-10	11:30	FISH	X	X	X	1
	POND J - COMPOSITE SAMPLE #10	06-12-10	11:40	MINNOWS	X	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

POP Organo-chlorine Screen / SPECIAL REQ - R+D - ED IS FOR DICHLOFLUANID, PENTACHLORONITROBENZENE, PROFENOFOS AND PROPAZINE IN FISH TISSUE - REFER TO ALS QUOTE Q25601

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Peter Lillingham	09-12-10	8:00 AM				°C				

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COC # _____

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Contact: Mr. Troy Small	☒ PDF ☐ Excel ☐ Digital ☐ Fax	○ Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT
Address: 466 Hodgson Road. Fredericton, NB	Email 1:	○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
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Invoice To Same as Report ? ☒ Yes ☐ No	Email 3:	**Analysis Request**
Hardcopy of Invoice with Report? ☒ Yes ☐ No	**Client / Project Information**	Please indicate below Filtered, Preserved or both (F, P, F/P)
Company:	Job #: 072011	
Contact:	PO / AFE:	
Address:	LSD:	
Phone: Fax:	Quote: Q25601	
Lab Work Order # (lab use only)	ALS Contact: Erin Beaudin	Sampler: Peter Billingham

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	OC SCREEN-POP-ED	LIPIDS - ED	SPECIAL REQUEST-ED	Number of Containers
	POND K - FILLET ANALYSIS #1	03-12-10	9:00	FISH	X	X	X	1
	POND K - FILLET ANALYSIS #2	03-12-10	9:15	FISH	X	X	X	1
	POND K - FILLET ANALYSIS #3	03-12-10	9:25	FISH	X	X	X	1
	POND K - FILLET ANALYSIS #4	03-12-10	9:40	FISH	X	X	X	1
	POND K - FILLET ANALYSIS #5	03-12-10	9:50	FISH	X	X	X	1
	POND K - WHOLE FISH #6	03-12-10	10:05	FISH	X	X	X	1
	POND K - WHOLE FISH #7	03-12-10	10:15	FISH	X	X	X	1
	POND K - WHOLE FISH #8	03-12-10	10:25	FISH	X	X	X	1
	POND K - WHOLE FISH #9	03-12-10	10:40	FISH	X	X	X	1
	POND K - COMPOSITE SAMPLE #10	03-12-10	10:55	MINNOWS	X	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

POP Organo-chlorine Screen / SPECIAL REQ - P+D - ED IS FOR DICHLOFLUANID, PENTACHLORONITROBENZENE, PROFENOFOS AND PROPAZINE IN FISH TISSUE - REFER TO ALS QUOTE Q25601

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SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Peter Billingham	09-12-10	8:00 AM				°C				

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COC # _____

Page 4 of 4

Report To		**Report Format / Distribution**		**Service Requested** (Rush for routine analysis subject to availability)
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Address:	46 Hodgson Road. Fredericton, NB	Email 1:		○ Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT
		Email 2:		○ Same Day or Weekend Emergency - Contact ALS to Confirm TAT
Phone:	(506) 458-1248 Fax: (506) 462-7616	Email 3:		**Analysis Request**
Invoice To	Same as Report ? ☒ Yes ☐ No	**Client / Project Information**		Please indicate below Filtered, Preserved or both (F, P, F/P)
	Hardcopy of Invoice with Report? ☒ Yes ☐ No	Job #:	072011	
Company:		PO / AFE:		
Contact:		LSD:		
Address:				
Phone:	Fax:	Quote #:	Q25601	
Lab Work Order # (lab use only)		ALS Contact:	Erin Beaudin	Sampler: Peter Lillingham

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	OC SCREEN-RP-ED	LIPIDS - ED	SPECIAL REQUEST-EX	Number of Containers
	REF POND - FILLET ANALYSIS #1	01-12-10	9:30	FISH	X	X	X	1
	REF POND - FILLET ANALYSIS #2	01-12-10	9:40	FISH	X	X	X	1
	REF POND - FILLET ANALYSIS #3	01-12-10	9:50	FISH	X	X	X	1
	REF POND - FILLET ANALYSIS #4	01-12-10	10:05	FISH	X	X	X	1
	REF POND - FILLET ANALYSIS #5	01-12-10	10:15	FISH	X	X	X	1
	REF POND - WHOLE FISH #6	01-12-10	10:25	FISH	X	X	X	1
	REF POND - WHOLE FISH #7	01-12-10	10:40	FISH	X	X	X	1
	REF POND - WHOLE FISH #8	01-12-10	10:55	FISH	X	X	X	1
	REF POND - WHOLE FISH #9	01-12-10	11:10	FISH	X	X	X	1
	REF POND - COMPOSITE SAMPLE #10	01-12-10	11:25	MINNOWS	X	X	X	1

Special Instructions / Regulations with water or land use (CCME-Freshwater Aquatic Life/BC CSR - Commercial/AB Tier 1 - Natural, etc) / Hazardous Details

ROP Organo-Chlorine Screen / SPECIAL REQ - R+D - ED IS FOR DICHLOFLUANID, PENTACHLORONITROBENZENE, PROFENOFOS AND PROPAZINE IN FISH TISSUE - REFER TO ALS QUOTE Q25601

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SHIPMENT RELEASE (Client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date (dd-mmm-yy)	Time (hh-mm)	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
Peter Lillingham	09-12-10	8:00 AM				°C				

GENF 18.01 Front

AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Rd.
RR 3
Guelph ON N1H 6H9
Tel: (519) 763-4412 Fax: (519) 763-4419

SAMPLE IDENTIFICATION

Work Order :	218194	Shipped By :	Fed Ex/Rd
Company :	Connestoga-Rovers & Associates - NB	Date Received :	2010-11-26
Location :	Fredericton NB	Time Received :	13:30
Sampling Method :	Grab	Date Tested :	2010-12-07
Sampled By :	P. Gillingham	Lab Storage :	4±2 °C

Test Method : Test for Survival and Growth in Sediment Using the larvae of Freshwater Midges (*Chironomus tentans* or *Chironomus riparius*). Environment Canada, Conservation and Protection. Ottawa, Ontario. Report EPS 1/RM/32, December, 1997.

SAMPLE SUMMARY

Sample Number	Sample Name	Description	Sample Date	Sample Time	Temp. on Arrival
-	Control	Fine brown organic sediment; no odour.	2009-05-25	12:00	-
29195	Sed-9 (Oxley's Pond)	Brown, some organic matter, odourless	2010-11-24	14:30	4.0 °C
29196	Sed-19 (Pond J)	Brown, some organic matter, odourless	2010-11-24	12:30	4.0 °C
29197	Sed-20 (Pond K)	Brown, some organic matter, odourless	2010-11-24	10:30	4.0 °C
29198	Background (Background Pond)	Brown, lots of organic matter, odourless	2010-11-24	16:00	4.0 °C

RESULTS

Survival Data (Treatment Average Survival, %)[1]

Sed-19 (Pond J)	Sed-9 (Oxley's Pond)	Sed-20 (Pond K)	Control	Background (Background Pond)
68	90	96	98	100

[1]**Tukey-Kramer Test (CETIS)[a]:** Samples sharing the same line are not significantly different from one another (i.e. they are considered to be homogenous, that is, from the same population) (α =0.05). Data did not meet the assumptions for normality and homogeneity of variance.

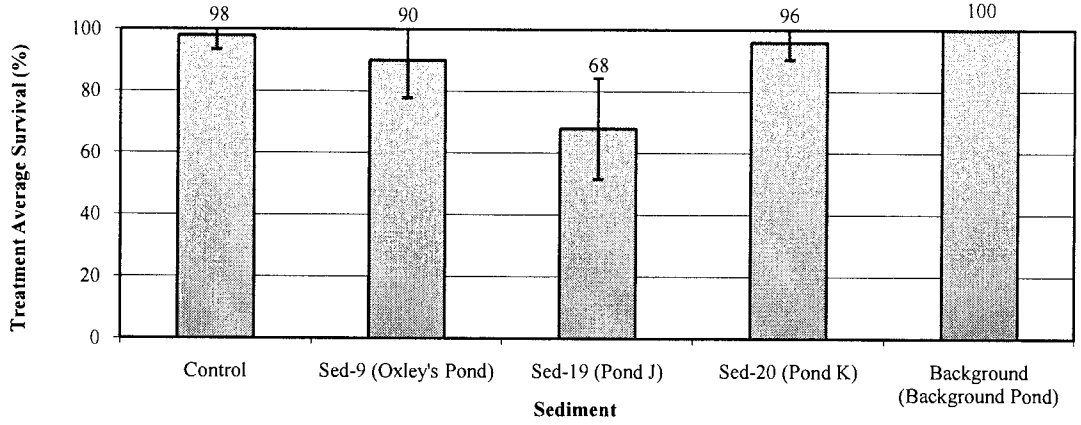
Growth Data (Treatment Average Weight, mg)[2]

Sed-19 (Pond J)	Sed-20 (Pond K)	Background (Background Pond)	Control	Sed-9 (Oxley's Pond)
0.317	1.306	1.696	1.780	1.807

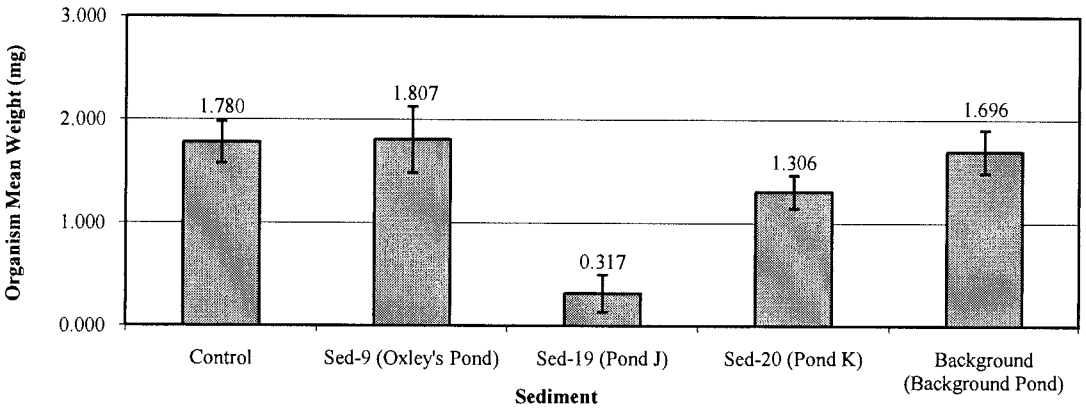
[2]**Tukey-Kramer Test (CETIS)[a]:** Samples sharing the same line are not significantly different from one another (i.e. they are considered to be homogenous, that is, from the same population) (α =0.05). All data sets met the assumptions for normality and homogeneity of variance (α=0.05).

Work Order : 218194

***Chironomus dilutus* Survival**



***Chironomus dilutus* Growth**



SEDIMENT CHARACTERISTICS

Sample Number	Sample Name	TOC (%)	Moisture Content (%)	Particle Size (%)			
				Gravel	Sand (0.05 - 2.0 mm)	Silt (0.002 - 0.05 mm)	Clay (<0.002 mm)
–	Control	8.9	72	0	0.9	98.2	1
29195	Sed-9 (Oxley's Pond)	12.1	90.7	–	5.6	60	34.4
29196	Sed-19 (Pond J)	23.9	87.3	–	64.6	32.6	2.74
29197	Sed-20 (Pond K)	5.01	89.1	–	3.0	74.4	22.6
29198	Background (Background Pond)	28.2	91.1	–	46.3	41	12.7

"–" = not measured

Work Order : 218194

TEST CONDITIONS

Test Organism:	*Chironomus dilutus*	Test Type:	Static
Organism Batch :	Ct10-11	Test Vessel:	300 mL pyrex beaker
Source:	In-house culture	Sediment Depth:	Approx. 3.5 cm
Source Location :	Guelph ON	Sediment Volume:	100 mL per replicate
Mean Head Capsule Width :	0.37 mm	Overlying Water Volume:	175 mL per replicate
Range of Head Capsule Widths :	0.28 - 0.43 mm	Control/Test Water:	Well water (no additional chemicals)
Life Stage on Test Day 0 :	3rd Instar	Control Sediment:	Long Point, Lake Erie
Samples per Treatment :	1	Test Aeration :	Yes (all replicates)
Number of Replicates:	5	Test Aeration Rate :	2-3 bubbles per second
Organisms per Replicate:	10	Photoperiod (light/dark) :	16 h / 8 h
Organisms per Treatment:	50	Light Intensity :	851 - 989 lux
Feed Type:	Tetramin flakes in R.O. water	Test Duration :	10 days
Feeding Rate (per replicate):	~6 mg dry solids daily	Test Method Deviations :	None

POTASSIUM CHLORIDE REFERENCE TOXICANT DATA

Test Date :	2010-11-15	Historical Mean LC50 :	4169 mg/L
Test Duration :	96 hours	Warning Limits (± 2 SD) :	2245 - 7743 mg/L
LC50 (95% confidence limits):	3509 mg/L (2748 - 4505)	Statistical Method :	Probit (Stephan)[c]
Organism Batch :	Ct10-11	Test Conducted By :	EJ/JGG/MR

The reference toxicant test was conducted as a water only test, as specified in the test method.

COMMENTS

The results reported relate only to the samples tested.
All test validity criteria as specified in the test method cited in this report were satisfied.
No organisms exhibiting unusual appearance, behavior, or undergoing unusual treatment were used in the test.

REFERENCES

[a] CETIS, © 2001-2007. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, McKinleyville, Calif. 95519 [Program on disk and printed User's Guide].

[c] Stephan, C. E. 1977. Methods for calculating an LC50. P. 65-84 In: P.L. Mayer and J. L. Hamelink (eds.), Aquatic Toxicology and Hazard Evaluation. Amer. Soc. Testing and Materials, Philadelphia PA. ASTM STP 634.

Date: 2011-01-25
yyyy-mm-dd

Approved by: J. Imdus
Project Manager

Work Order : 218194

Chironomus dilutus Survival Data

Sample	Replicate	Number of Survivors (n=10)	Surviving Organisms (%)	Treatment Average Survival (%)	Standard Deviation	CV (%)
Control	A	10	100	98	4.5	4.6
	B	10	100			
	C	10	100			
	D	10	100			
	E	9	90			
29195 **Sed-9 (Oxley's Pond)**	A	9	90	90	12.2	13.6
	B	10	100			
	C	10	100			
	D	7	70			
	E	9	90			
29196 **Sed-19 (Pond J)**	A	8	80	68	16.4	24.2
	B	5	50			
	C	8	80			
	D	8	80			
	E	5	50			
29197 **Sed-20 (Pond K)**	A	10	100	96	5.5	5.7
	B	9	90			
	C	9	90			
	D	10	100			
	E	10	100			
29198 **Background (Background Pond)**	A	0*	0*	100	0.0	0.0
	B	10	100			
	C	10	100			
	D	10	100			
	E	10	100			

*NOTES : Due to technical error, test organisms likely not introduced to replicate 29198 A at test initiation. Therefore replicate 29198 A was excluded from statistical analysis for all test endpoints.

Data Reviewed By: _____
Date: 2011-01-25

Work Order : 218194

Chironomus dilutus Weight Data

Sample	Replicate	Foil Weight (mg)	Dry Weight of Foil + Organisms (mg)	Number of Organisms Weighed	Mean Dry Weight of Organisms (mg)	Treatment Mean Dry Weight (mg)	Standard Deviation	CV (%)
	A	767.33	783.50	10	1.617	1.780	0.20	11.0
Control	B	775.53	791.94	10	1.641			
	C	790.30	807.14	10	1.684			
	D	774.04	794.80	10	2.076			
	E	770.62	787.54	9	1.880			
	A	766.40	777.92	9	1.280	1.807	0.32	17.8
29195	B	764.92	782.08	10	1.716			
Sed-9 (Oxley's Pond)	C	771.83	792.03	10	2.020			
	D	766.46	780.42	7	1.994			
	E	765.80	784.02	9	2.024			
	A	778.29	783.23	8	0.618	0.317	0.18	57.5
29196	B	757.58	758.38	5	0.160			
Sed-19 (Pond J)	C	780.48	782.61	8	0.266			
	D	775.19	777.96	8	0.346			
	E	778.18	779.16	5	0.196			
	A	771.60	784.48	10	1.288	1.306	0.16	12.0
29197	B	778.56	790.08	9	1.280			
Sed-20 (Pond K)	C	763.27	773.79	9	1.169			
	D	807.05	822.78	10	1.573			
	E	807.44	819.64	10	1.220			
	A*	798.60	–	0	–	1.696	0.21	12.4
29198	B	803.78	818.17	10	1.439			
Background	C	801.63	820.55	10	1.892			
(Background Pond)	D	770.04	786.16	10	1.612			
	E	831.98	850.37	10	1.839			

*NOTES: Replicate 29198 A excluded from statistical analysis (see 'NOTES', page 4).

Data Reviewed By: RL
Date: 2011-01-25

Chironomus dilutus Sediment Test Data

Work Order :	218194
Sample Number :	**Control**
Species:	*Chironomus dilutus*
Organism Batch :	Ct10-11
Sediment pH:	6.6
Pore Water pH:	7.1
Pore Water Ammonia (mg/L) :	0.5
Sample Treatment:	Dry sieved (2 mm)
Time Start:	12:25

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2010-12-07	23.0	Composite	8.0	Y	NK	557	8.3	270	0.00	0.00
1	Wed	2010-12-08	23.0	A	8.2	Y	XD/JGG	–	–	–	–	–
2	Thurs	2010-12-09	23.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2010-12-10	23.0	B	7.7	Y	XD/JGG	–	–	–	–	–
4	Sat	2010-12-11	23.0	–	–	Y	MR	–	–	–	–	–
5	Sun	2010-12-12	23.0	–	–	Y	MR	–	–	–	–	–
6	Mon	2010-12-13	23.0	C	8.1	Y	XD/JGG	–	–	–	–	–
7	Tues	2010-12-14	23.0	–	–	Y	XD/JGG	–	–	–	–	–
8	Wed	2010-12-15	23.0	D	7.8	Y	XD/JGG	–	–	–	–	–
9	Thurs	2010-12-16	23.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2010-12-17	23.0	Composite	7.8	N	XD/JGG	667	8.2	320	0.20	0.01

"–" = not measured/not required

Data Reviewed By: JM
Date: 2011-01-14

Chironomus dilutus Sediment Test Data

Work Order : 218194
Sample Number : **29195**
Species: *Chironomus dilutus*
Organism Batch : Ct10-11
Sediment pH: 6.0
Pore Water pH: 6.6
Pore Water Ammonia (mg/L) : 1.6
Sample Treatment: Hand homogenization
Time Start: 12:30

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2010-12-07	23.0	Composite	8.1	Y	NK	269	8.1	110	0.05	0.00
1	Wed	2010-12-08	23.0	A	8.0	Y	XD/JGG	–	–	–	–	–
2	Thurs	2010-12-09	23.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2010-12-10	23.0	B	8.0	Y	XD/JGG	–	–	–	–	–
4	Sat	2010-12-11	23.0	–	–	Y	MR	–	–	–	–	–
5	Sun	2010-12-12	23.0	–	–	Y	MR	–	–	–	–	–
6	Mon	2010-12-13	23.0	C	7.7	Y	XD/JGG	–	–	–	–	–
7	Tues	2010-12-14	23.0	–	–	Y	XD/JGG	–	–	–	–	–
8	Wed	2010-12-15	23.0	D	7.8	Y	XD/JGG	–	–	–	–	–
9	Thurs	2010-12-16	23.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2010-12-17	23.0	Composite	7.8	N	XD/JGG	281	7.4	50	7.40	0.09

"–" = not measured/not required

Data Reviewed By: SM
Date: 2011-01-14

Chironomus dilutus Sediment Test Data

Work Order : 218194
Sample Number : **29196**
Species: *Chironomus dilutus*
Organism Batch : Ct10-11
Sediment pH: 5.7
Pore Water pH: 6.1
Pore Water Ammonia (mg/L) : 16.3
Sample Treatment: Hand homogenization
Time Start: 12:35

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2010-12-07	23.0	Composite	7.9	Y	NK	261	7.6	140	0.25	0.00
1	Wed	2010-12-08	23.0	A	8.1	Y	XD/JGG	–	–	–	–	–
2	Thurs	2010-12-09	23.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2010-12-10	23.0	B	8.3	Y	XD/JGG	–	–	–	–	–
4	Sat	2010-12-11	23.0	–	–	Y	MR	–	–	–	–	–
5	Sun	2010-12-12	23.0	–	–	Y	MR	–	–	–	–	–
6	Mon	2010-12-13	23.0	C	8.0	Y	XD/JGG	–	–	–	–	–
7	Tues	2010-12-14	23.0	–	–	Y	XD/JGG	–	–	–	–	–
8	Wed	2010-12-15	23.0	D	7.4	Y	XD/JGG	–	–	–	–	–
9	Thurs	2010-12-16	23.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2010-12-17	23.0	Composite	7.5	N	XD/JGG	294	7.4	100	11.00	0.13

"–" = not measured/not required

Data Reviewed By: SM
Date: 2011-01-14

Chironomus dilutus Sediment Test Data

Work Order : 218194
Sample Number : **29197**
Species: *Chironomus dilutus*
Organism Batch : Ct10-11
Sediment pH: 5.9
Pore Water pH: 6.3
Pore Water Ammonia (mg/L) : 0.2
Sample Treatment: Hand homogenization
Time Start: 12:40

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2010-12-07	23.0	Composite	8.0	Y	NK	363	8.1	170	0.00	0.00
1	Wed	2010-12-08	23.0	A	7.8	Y	XD/JGG	–	–	–	–	–
2	Thurs	2010-12-09	23.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2010-12-10	23.0	B	8.0	Y	XD/JGG	–	–	–	–	–
4	Sat	2010-12-11	23.0	–	–	Y	MR	–	–	–	–	–
5	Sun	2010-12-12	23.0	–	–	Y	MR	–	–	–	–	–
6	Mon	2010-12-13	23.0	C	8.0	Y	XD/JGG	–	–	–	–	–
7	Tues	2010-12-14	23.0	–	–	Y	XD/JGG	–	–	–	–	–
8	Wed	2010-12-15	23.0	D	7.8	Y	XD/JGG	–	–	–	–	–
9	Thurs	2010-12-16	23.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2010-12-17	23.0	Composite	7.7	N	XD/JGG	318	7.4	140	0.75	0.01

"–" = not measured/not required

Data Reviewed By: SM
Date: 2011-01-14

Chironomus dilutus Sediment Test Data

Work Order : 218194
Sample Number : **29198**
Species: *Chironomus dilutus*
Organism Batch : Ct10-11
Sediment pH: 6.0
Pore Water pH: 6.7
Pore Water Ammonia (mg/L) : 1.2
Sample Treatment: Hand homogenization
Time Start: 12:45

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µmhos/cm)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2010-12-07	23.0	Composite	8.0	Y	NK	303	8.0	110	0.55	0.03
1	Wed	2010-12-08	23.0	A	7.9	Y	XD/JGG	–	–	–	–	–
2	Thurs	2010-12-09	23.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2010-12-10	23.0	B	8.0	Y	XD/JGG	–	–	–	–	–
4	Sat	2010-12-11	23.0	–	–	Y	MR	–	–	–	–	–
5	Sun	2010-12-12	23.0	–	–	Y	MR	–	–	–	–	–
6	Mon	2010-12-13	23.0	C	7.9	Y	XD/JGG	–	–	–	–	–
7	Tues	2010-12-14	23.0	–	–	Y	XD/JGG	–	–	–	–	–
8	Wed	2010-12-15	23.0	D	7.6	Y	XD/JGG	–	–	–	–	–
9	Thurs	2010-12-16	23.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2010-12-17	23.0	Composite	7.8	N	XD/JGG	243	6.9	90	0.20	0.00

"–" = not measured/not required

Data Reviewed By: SM
Date: 2011-01-19

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 218194

Shipping Address: AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Road, RR #3
Guelph, Ontario Canada N1H 6H9

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number: 072004
Field Sampler Name (print): Peter Gillingham
Signature: [signature]
Affiliation: CRA
Sample Storage (prior to shipping): Cooler
Custody Relinquished by: Peter Gillingham [signature]
Date/Time Shipped: November 25, 2010 / 2:00pm

Client: Conestoga-Rovers & Associates
466 Hodgson Rd.
Fredericton, NB
E3C 2G5

Phone: 506-458-1248
Fax: 506-462-7646
Contact: Troy Small

Sample Identification					Analyses Requested						Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	*Hyalella azteca* 14-d Survival and Growth	*Chironomus sp.* 10-d Survival and Growth	*Hexagenia limbata* 21-d Survival and Growth	Fathead Minnow 21-d Survival and Bioaccumulation	Microtox Solid Phase	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. one 6 L pail; one 20 L pail etc.)
2010-11-24	14:30	Sed - 9 (Oxley's Pond)	29195	4.0		✓		✓			✓		1 X 6L Pail
2010-11-24	12:30	Sed - 19 (Pond J)	29196	4.0		✓		✓			✓		
2010-11-24	10:30	Sed - 20 (Pond K)	29197	4.0		✓		✓			✓		
2010-11-24	16:00	Background (Background Pond)	29198	4.0		✓		✓			✓		

For Lab Use Only
Received By: KDurie
Date: 2010-11-26
Time: 13:30
Storage Location:
Storage Temp.(°C):

Please list any special requests or instructions:

2010-

FW

AQUATOX
AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Rd.
RR 3
Guelph ON N1H 6H9
Tel: (519) 763-4412 Fax: (519) 763-4419

SAMPLE IDENTIFICATION

Work Order :	218194	Shipped By :	Fed Ex/Rd
Company :	Connestoga-Rovers & Associates - NB	Date Received :	2010-11-26
Location :	Fredericton NB	Time Received :	13:30
Sampling Method :	Grab	Date Tested :	2010-11-30
Sampled By :	P. Gillingham	Lab Storage :	4±2 °C
Sample Volume :	1 x 6 L pail		

Test Method : Ontario Ministry of the Environment Laboratory Sediment Biological Testing Protocol, August 1992.

SAMPLE SUMMARY

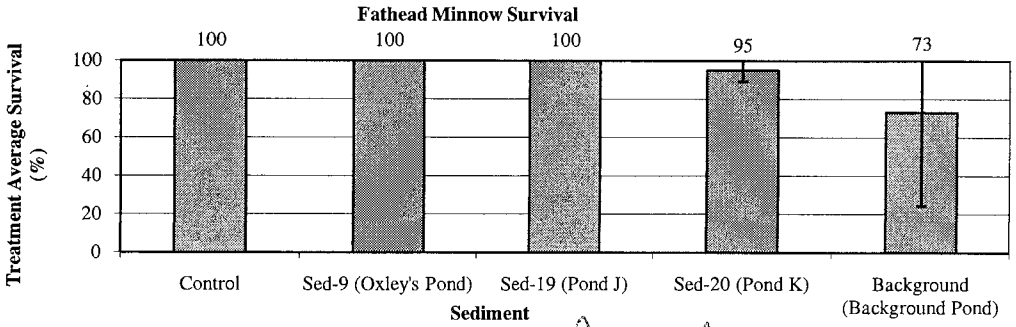
Sample Number	Sample Name	Description	Sample Date	Sample Time	Temp. on Arrival
-	Control	Fine brown organic sediment; no odour.	2006-08-28	11:00	-
29195	Sed-9 (Oxley's Pond)	Brown, some organic matter, odourless	2010-11-24	14:30	4.0 °C
29196	Sed-19 (Pond J)	Brown, some organic matter, odourless	2010-11-24	12:30	4.0 °C
29197	Sed-20 (Pond K)	Brown, some organic matter, odourless	2010-11-24	10:30	4.0 °C
29198	Background (Background Pond)	Brown, lots of organic matter, odourless	2010-11-24	16:00	4.0 °C

RESULTS

Survival Data (Treatment Average Survival, %)[a]

Background (Background Pond)	Sed-20 (Pond K)	Control	Sed-9 (Oxley's Pond)	Sed-19 (Pond J)
73	95	100	100	100

[1]**Kolmogorov-Smirnov (CETIS)[a]:** Samples sharing the same line are not significantly different from one another (i.e. they are considered to be homogenous, that is, from the same population) (α =0.05). Data did not meet the assumptions for normality and homogeneity of variance.



Date: 2011-01-25
yyyy/mm/dd

Approved by: J. Inda
Project Manager

Work Order : 218194

SEDIMENT CHARACTERISTICS

Sample Number	Sediment	TOC (%)	Moisture Content (%)	Particle Size (%) Gravel	Sand (0.05 - 2.0 mm)	Silt (0.002 - 0.05 mm)	Clay (<0.002 mm)
–	Control	8.9	72	0	0.9	98.2	1
29195	Sed-9 (Oxley's Pond)	12.1	90.7	–	5.6	60	34.4
29196	Sed-19 (Pond J)	23.9	87.3	–	64.6	32.6	2.74
29197	Sed-20 (Pond K)	5.01	89.1	–	3.0	74.4	22.6
29198	Background (Background Pond)	28.2	91.1	–	46.3	41	12.7

"–" = not measured

TEST CONDITIONS

Test Organism:	*Pimephales promelas*	Test Vessel:	1.8L glass jar
Source:	In-house Culture	Sediment Depth:	~2.5 to 3 cm
Source Location :	AquaTox	Sediment Volume:	325 mL per replicate
Life Stage on Test Day 0 :	Juvenile	Overlying Water Volume:	1300 mL per replicate
Test Type:	Static	Control/Test Water:	Well water (no chemicals added)
Samples per Treatment :	1	Control Sediment:	Long Point, Lake Erie
Number of Replicates:	4	Test Aeration :	Yes (all replicates)
Organisms per Replicate:	10	Test Aeration Rate :	2-3 bubbles per second
Organisms per Treatment:	40	Photoperiod (light/dark) :	16 h / 8 h
Feed Type:	Tetramin Flakes	Light Intensity :	445 - 529 lux
Feeding Rate (per replicate):	1% of biomass	Test Duration :	21 days
		Test Method Deviations :	None

COMMENTS

The results reported relate only to the samples tested.
All test validity criteria as specified in the test method cited in this report were met.
No organisms exhibiting unusual appearance, behavior, or undergoing unusual treatment were used in the test.

REFERENCES

[a] CETIS, © 2001-2007. Comprehensive Environmental Toxicity Information System. Tidepool Scientific Software, McKinleyville, Calif. 95519 [Program on disk and printed User's Guide].

Work Order : 218194

Fathead Minnow Survival Data

Sample	Replicate	Number of Survivors (n=10)	Surviving Organisms (%)	Treatment Average Survival (%)	Standard Deviation	CV (%)
Control	A	10	100	100	0.0	0.0
	B	10	100			
	C	10	100			
	D	10	100			
29195 Sed-9 (Oxley's Pond)	A	10	100	100	0.0	0.0
	B	10	100			
	C	10	100			
	D	10	100			
29196 Sed-19 (Pond J)	A	10	100	100	0.0	0.0
	B	10	100			
	C	10	100			
	D	10	100			
29197 Sed-20 (Pond K)	A	9	90	95	5.8	6.1
	B	9	90			
	C	10	100			
	D	10	100			
29198 Background (Background Pond)	A	9	90	73	48.6	67.0
	B	0	0			
	C	10	100			
	D	10	100			

Data Reviewed By: SM
Date: 2011-01-14

Fathead Minnow Sediment Test Data

Work Order : 218194
Sample Number : **Control**
Species: *Pimephales promelas*
Organism Batch : Fm10-04
Sediment pH: 7.2
Pore Water pH: 7.1
Pore Water Ammonia (mg/L) : 0.0
Sample Treatment: Dry sieved (2 mm)
Time Start: 12:30

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µs)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2010-11-30	22.0	A	8.3	Y	JGG	668	8.2	310	0.10	0.01
1	Wed	2010-12-01	22.0	–	–	Y	JGG	–	–	–	–	–
2	Thurs	2010-12-02	22.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2010-12-03	22.0	–	–	Y	LB	–	–	–	–	–
4	Sat	2010-12-04	22.0	–	–	Y	LB	–	–	–	–	–
5	Sun	2010-12-05	22.0	–	–	Y	LB	–	–	–	–	–
6	Mon	2010-12-06	22.0	–	–	Y	JGG	–	–	290	8.85	–
7	Tues	2010-12-07	22.0	–	–	Y	JGG	–	–	–	–	–
8	Wed	2010-12-08	22.0	–	–	Y	JGG	–	–	–	–	–
9	Thurs	2010-12-09	22.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2010-12-10	22.0	–	–	Y	MR	–	–	–	–	–
11	Sat	2010-12-11	22.0	–	–	Y	MR	–	–	–	–	–
12	Sun	2010-12-12	21.0	–	–	Y	MR	–	–	–	–	–
13	Mon	2010-12-13	21.0	A	7.1	Y	NK/XD	697	8.1	–	–	–
14	Tues	2010-12-14	21.0	–	–	Y	JGG	–	–	–	–	–
15	Wed	2010-12-15	22.0	–	–	Y	EW	–	–	–	–	–
16	Thurs	2010-12-16	22.0	–	–	Y	JGG	–	–	240	17.50	–
17	Fri	2010-12-17	22.0	–	–	Y	JGG	–	–	–	–	–
18	Sat	2010-12-18	21.0	–	–	Y	JGG	–	–	–	–	–
19	Sun	2010-12-19	21.0	–	–	Y	JGG	–	–	–	–	–
20	Mon	2010-12-20	21.0	–	–	Y	JGG	–	–	–	–	–
21	Tues	2010-12-21	21.0	Composite	6.5	N	LB/JGG	557	7.6	280	3.35	0.06

"–" = not measured

Data Reviewed By: SM
Date: 2011-01-19

Fathead Minnow Sediment Test Data

Work Order : 218194
Sample Number : **29195**
Species: *Pimephales promelas*
Organism Batch : Fm10-04
Sediment pH: 6.0
Pore Water pH: 6.6
Pore Water Ammonia (mg/L) : 1.6
Sample Treatment: Hand homogenization
Time Start: 12:50

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µs)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2010-11-30	22.0	A	7.7	Y	JGG	468	7.4	180	0.45	0.01
1	Wed	2010-12-01	22.0	–	–	Y	JGG	–	–	–	–	–
2	Thurs	2010-12-02	22.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2010-12-03	23.0	–	–	Y	LB	–	–	–	–	–
4	Sat	2010-12-04	22.0	–	–	Y	LB	–	–	–	–	–
5	Sun	2010-12-05	22.0	–	–	Y	LB	–	–	–	–	–
6	Mon	2010-12-06	22.0	–	–	Y	JGG	–	–	140	7.05	–
7	Tues	2010-12-07	22.0	–	–	Y	JGG	–	–	–	–	–
8	Wed	2010-12-08	22.0	–	–	Y	JGG	–	–	–	–	–
9	Thurs	2010-12-09	22.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2010-12-10	22.0	–	–	Y	MR	–	–	–	–	–
11	Sat	2010-12-11	22.0	–	–	Y	MR	–	–	–	–	–
12	Sun	2010-12-12	22.0	–	–	Y	MR	–	–	–	–	–
13	Mon	2010-12-13	21.0	A	6.1	Y	NK/XD	445	7.7	–	–	–
14	Tues	2010-12-14	21.0	–	–	Y	JGG	–	–	–	–	–
15	Wed	2010-12-15	22.0	–	–	Y	EW	–	–	–	–	–
16	Thurs	2010-12-16	22.0	–	–	Y	JGG	–	–	100	20.00	–
17	Fri	2010-12-17	22.0	–	–	Y	JGG	–	–	–	–	–
18	Sat	2010-12-18	21.0	–	–	Y	JGG	–	–	–	–	–
19	Sun	2010-12-19	21.0	–	–	Y	JGG	–	–	–	–	–
20	Mon	2010-12-20	21.0	–	–	Y	JGG	–	–	–	–	–
21	Tues	2010-12-21	21.0	Composite	6.6	N	LB/JGG	418	7.8	130	29.00	0.76

"–" = not measured

Data Reviewed By: SM
Date: 2011-01-19

Fathead Minnow Sediment Test Data

Work Order : 218194
Sample Number : **29196**
Species: *Pimephales promelas*
Organism Batch : Fm10-04
Sediment pH: 5.7
Pore Water pH: 6.1
Pore Water Ammonia (mg/L) : 16.3
Sample Treatment: Hand homogenization
Time Start: 13:10

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µs)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2010-11-30	22.0	A	6.6	Y	JGG	443	6.9	190	4.50	0.02
1	Wed	2010-12-01	22.0	–	–	Y	JGG	–	–	–	–	–
2	Thurs	2010-12-02	22.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2010-12-03	23.0	–	–	Y	LB	–	–	–	–	–
4	Sat	2010-12-04	22.0	–	–	Y	LB	–	–	–	–	–
5	Sun	2010-12-05	22.0	–	–	Y	LB	–	–	–	–	–
6	Mon	2010-12-06	22.0	–	–	Y	JGG	–	–	110	9.75	–
7	Tues	2010-12-07	22.0	–	–	Y	JGG	–	–	–	–	–
8	Wed	2010-12-08	22.0	–	–	Y	JGG	–	–	–	–	–
9	Thurs	2010-12-09	22.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2010-12-10	22.0	–	–	Y	MR	–	–	–	–	–
11	Sat	2010-12-11	22.0	–	–	Y	MR	–	–	–	–	–
12	Sun	2010-12-12	22.0	–	–	Y	MR	–	–	–	–	–
13	Mon	2010-12-13	21.0	A	6.1	Y	NK/XD	342	7.1	–	–	–
14	Tues	2010-12-14	21.0	–	–	Y	JGG	–	–	–	–	–
15	Wed	2010-12-15	22.0	–	–	Y	EW	–	–	–	–	–
16	Thurs	2010-12-16	22.0	–	–	Y	JGG	–	–	100	18.50	–
17	Fri	2010-12-17	22.0	–	–	Y	JGG	–	–	–	–	–
18	Sat	2010-12-18	21.0	–	–	Y	JGG	–	–	–	–	–
19	Sun	2010-12-19	21.0	–	–	Y	JGG	–	–	–	–	–
20	Mon	2010-12-20	21.0	–	–	Y	JGG	–	–	–	–	–
21	Tues	2010-12-21	21.0	Composite	7.1	N	LB/JGG	308	7.4	90	23.75	0.25

"–" = not measured

Data Reviewed By: SM
Date: 2011-01-19

Fathead Minnow Sediment Test Data

Work Order :	218194
Sample Number :	**29197**
Species:	*Pimephales promelas*
Organism Batch :	Fm10-04
Sediment pH:	5.9
Pore Water pH:	6.3
Pore Water Ammonia (mg/L) :	0.2
Sample Treatment:	Hand homogenization
Time Start:	13:30

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µs)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2010-11-30	22.0	A	8.3	Y	JGG	566	8.1	250	0.50	0.03
1	Wed	2010-12-01	22.0	–	–	Y	JGG	–	–	–	–	–
2	Thurs	2010-12-02	22.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2010-12-03	23.0	–	–	Y	LB	–	–	–	–	–
4	Sat	2010-12-04	22.0	–	–	Y	LB	–	–	–	–	–
5	Sun	2010-12-05	22.0	–	–	Y	LB	–	–	–	–	–
6	Mon	2010-12-06	22.0	–	–	Y	JGG	–	–	170	7.75	–
7	Tues	2010-12-07	22.0	–	–	Y	JGG	–	–	–	–	–
8	Wed	2010-12-08	22.0	–	–	Y	JGG	–	–	–	–	–
9	Thurs	2010-12-09	22.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2010-12-10	22.0	–	–	Y	MR	–	–	–	–	–
11	Sat	2010-12-11	22.0	–	–	Y	MR	–	–	–	–	–
12	Sun	2010-12-12	22.0	–	–	Y	MR	–	–	–	–	–
13	Mon	2010-12-13	21.0	A	7.5	Y	NK/XD	482	8.0	–	–	–
14	Tues	2010-12-14	21.0	–	–	Y	JGG	–	–	–	–	–
15	Wed	2010-12-15	22.0	–	–	Y	EW	–	–	–	–	–
16	Thurs	2010-12-16	22.0	–	–	Y	JGG	–	–	120	21.75	–
17	Fri	2010-12-17	22.0	–	–	Y	JGG	–	–	–	–	–
18	Sat	2010-12-18	21.0	–	–	Y	JGG	–	–	–	–	–
19	Sun	2010-12-19	21.0	–	–	Y	JGG	–	–	–	–	–
20	Mon	2010-12-20	21.0	–	–	Y	JGG	–	–	–	–	–
21	Tues	2010-12-21	21.0	Composite	4.4	N	LB/JGG	394	6.9	160	28.00	0.09

"–" = not measured

Data Reviewed By: SM
Date: 2011-01-19

Fathead Minnow Sediment Test Data

Work Order :	218194
Sample Number :	**29198**
Species:	*Pimephales promelas*
Organism Batch :	Fm10-04
Sediment pH:	6.0
Pore Water pH:	6.7
Pore Water Ammonia (mg/L) :	1.2
Sample Treatment:	Hand homogenization
Time Start:	13:50

Test Day	Day	Date	Temp. (°C)	Replicate	D.O. (mg/L)	Test Fed? (Y/N)	Analyst(s)	Conductivity (µs)	pH	Hardness (mg/l as $CaCO_3$)	Total Ammonia (mg/L)	Unionized Ammonia (mg/L)
0	Tues	2010-11-30	22.0	A	8.2	Y	JGG	488	7.9	200	0.45	0.02
1	Wed	2010-12-01	22.0	–	–	Y	JGG	–	–	–	–	–
2	Thurs	2010-12-02	22.0	–	–	Y	JGG	–	–	–	–	–
3	Fri	2010-12-03	23.0	–	–	Y	LB	–	–	–	–	–
4	Sat	2010-12-04	22.0	–	–	Y	LB	–	–	–	–	–
5	Sun	2010-12-05	22.0	–	–	Y	LB	–	–	–	–	–
6	Mon	2010-12-06	22.0	–	–	Y	JGG	–	–	150	7.70	–
7	Tues	2010-12-07	22.0	–	–	Y	JGG	–	–	–	–	–
8	Wed	2010-12-08	22.0	–	–	Y	JGG	–	–	–	–	–
9	Thurs	2010-12-09	22.0	–	–	Y	JGG	–	–	–	–	–
10	Fri	2010-12-10	22.0	–	–	Y	MR	–	–	–	–	–
11	Sat	2010-12-11	22.0	–	–	Y	MR	–	–	–	–	–
12	Sun	2010-12-12	22.0	–	–	Y	MR	–	–	–	–	–
13	Mon	2010-12-13	21.0	A	6.7	Y	NK/XD	510	7.9	–	–	–
14	Tues	2010-12-14	21.0	–	–	Y	JGG	–	–	–	–	–
15	Wed	2010-12-15	22.0	–	–	Y	EW	–	–	–	–	–
16	Thurs	2010-12-16	22.0	B	4.0*	Y	JGG	–	–	160	22.30	–
17	Fri	2010-12-17	22.0	–	–	Y	JGG	–	–	150	3.55**	–
18	Sat	2010-12-18	21.0	–	–	Y	JGG	–	–	–	–	–
19	Sun	2010-12-19	21.0	–	–	Y	JGG	–	–	–	–	–
20	Mon	2010-12-20	21.0	–	–	Y	JGG	–	–	–	–	–
21	Tues	2010-12-21	21.0	Composite	6.5	N	LB/JGG	557	7.6	160	9.60	0.16

"–" = not measured

Notes: *2010-12-16 : Complete mortality of test organisms observed in replicate 29198 B. Dissolved oxygen saturation = 49%. Dead test organisms were removed.
**2010-12-17: A sub-sample of 29198 B overlying water was removed for measurement of total ammonia (JGG).

Data Reviewed By: [illegible]
Date: 2011-01-25

CHAIN OF CUSTODY RECORD

AQUATOX

AquaTox Work Order No: 218194

Shipping Address: AquaTox Testing & Consulting Inc.
11B Nicholas Beaver Road, RR #3
Guelph, Ontario Canada N1H 6H9

Voice: (519) 763-4412 **Fax:** (519) 763-4419

P.O. Number: 072004
Field Sampler Name (print): Peter Gillingham
Signature: [signature]
Affiliation: CRA
Sample Storage (prior to shipping): Cooler
Custody Relinquished by: Peter Gillingham [signature]
Date/Time Shipped: November 25, 2010 / 2:00 pm

Client: Conestoga-Rovers & Associates
466 Hodgson Rd.
Fredericton, NB
E3C 2G5

Phone: 506-458-1248
Fax: 506-462-7646
Contact: Troy Small

Sample Identification					Analyses Requested						Sample Method and Volume		
Date Collected (yyyy-mm-dd)	Time Collected (e.g. 14:30, 24 hr clock)	Sample Name	AquaTox Sample Number	Temp. on arrival	*Hyallella azteca* 14-d Survival and Growth	*Chironomus sp.* 10-d Survival and Growth	*Hexagenia limbata* 21-d Survival and Growth	Fathead Minnow 21-d Survival and Bioaccumulation	Microtox Solid Phase	Other (please specify below)	Grab	Composite	# of Containers and Volume (eg. one 6 L pail; one 20 L pail etc.)
2010-11-24	14:30	Sed - 9 (Oxley's Pond)	29195	4.0		✓		✓			✓		1 X 6L Pail
2010-11-24	12:30	Sed - 19 (Pond J)	29196	4.0		✓		✓			✓		
2010-11-24	10:30	Sed - 20 (Pond K)	29197	4.0		✓		✓			✓		
2010-11-24	16:00	Background (Background Pond)	29198	4.0		✓		✓			✓		

For Lab Use Only
Received By: KDube
Date: 2010-11-26
Time: 13:30
Storage Location:
Storage Temp.(°C):

Please list any special requests or instructions:

2010-11-01

APPENDIX D

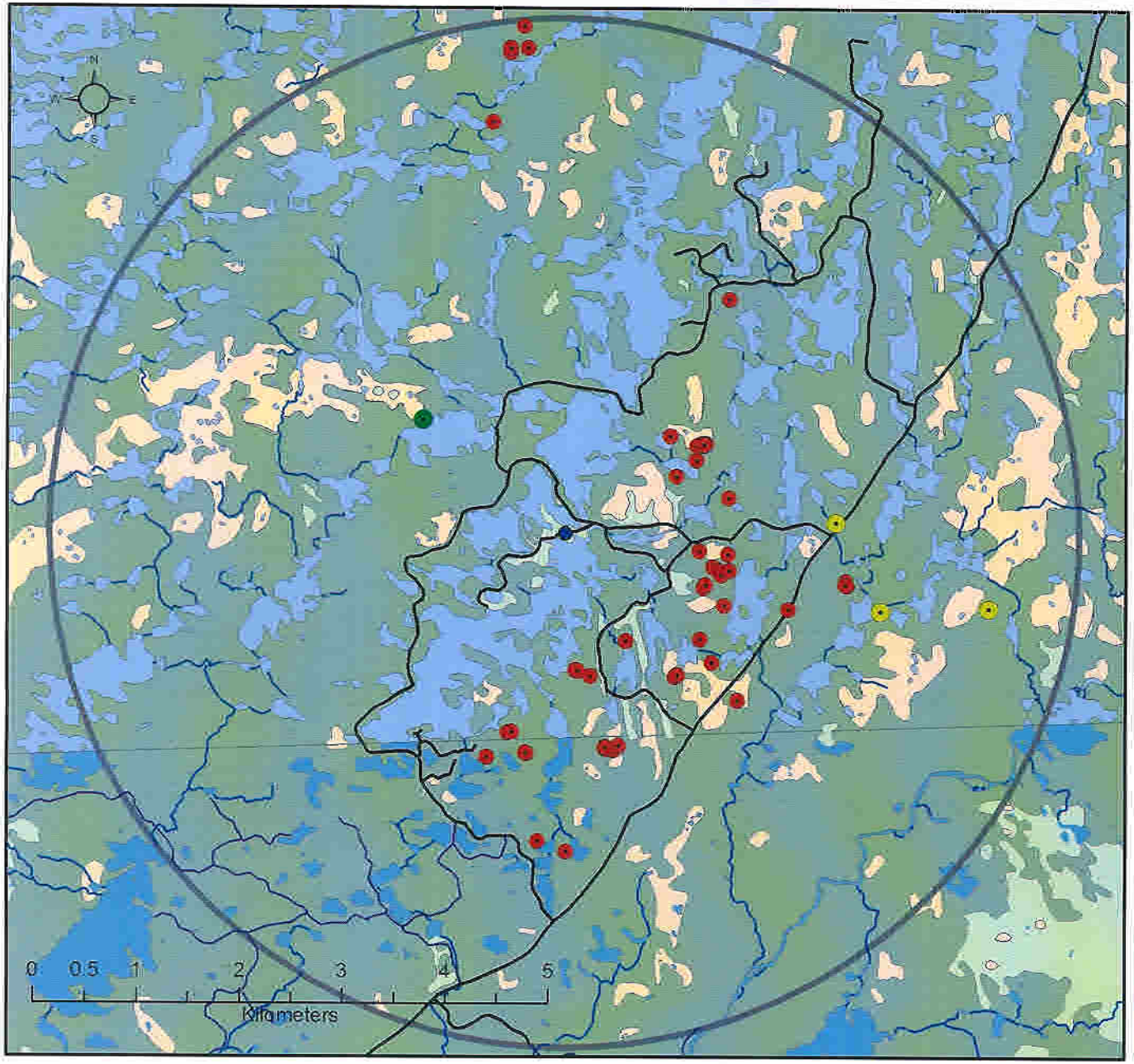
ACCDC DATABASE INFORMATION

DATA SOURCES:
All data housed at Atlantic Canada Conservation Data Centre (ACCDC). Refer to 'CITATION' field for data sources.

CAVEATS:
ACCDC rare taxa occurrence records are offered as a guide recognizing that the ability to find plants and animals will depend upon the season. The ACCDC makes a strong effort to verify the accuracy of all the data it obtains, generates and manages, but it will not be held responsible for inaccuracies in data that it provides.

PLEASE NOTE:
* ACCDC data is restricted for use by the specified data user only; any third party requiring data must make its own request to the ACCDC.
* Specified data users may not publish any information provided by the ACCDC or its partners without prior permission.
* To ensure the currency of the data, the ACCDC requires Data Users to destroy all copies of data 18 months after the date of receipt.
* ACCDC data reports are restricted to that data in our Data System at the time of the request.
* Data accuracy is qualified as to location (Accuracy) and time (Date)
* ACCDC data reports are not to be constructed as exhaustive inventories of taxa in an area.
* The non-occupancy of a taxon cannot be inferred by its absence in an ACCDC data report.
* Museum databases, which are the basis for more accessible public databases, such as those of the ACCDC, are works in progress. Essentially, they are finding aids and dynamic data records, constructed primarily to serve scientists engaged in the continuing, active process of plant systematics and taxonomy. Ongoing additions of new collections, and frequent upgrades to the identifications of all plant specimens housed in museum herbaria, may not always be reflected, in real time, by databases such as those of the ACCDC. Specifically, the conservation status of individual species recorded in the ACCDC database may not be absolutely current. It is therefore the responsibility of the data user to contact the relevant museums directly, in order to check for the most current identifications of specimens of interest, and to ascertain from the scientists concerned, their current understanding of the conservation status of individual species in question. The absolute conservation status of any given species is dynamic, and subject to change over short periods of time.

GIS Scan of Rare and Provincially/Federally Listed Species near Salmonier Line, at coordinates 47 16 04.61 N, 53 18 57.65 W.



Legend

- Boreal Felt Lichen
- Rare Bird Sightings
- Rare Plants
- Point of Interest
- Buffer

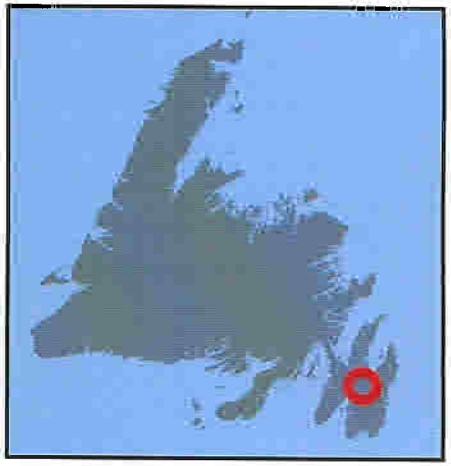
Newfoundland Labrador

Atlantic Canada Conservation Data Centre

January 20, 2010
For
Data Request: RQ0245

Datum: Transverse Mercator NAD83

Note: Interpretations of this map should always be conducted in relation with data provided in spreadsheet and any other communications



GNAME	GCOMNAM	Observer	Month	Day	Year	SRANK	NRANK	GRANK	GeneralSta	FAMILY	DESCR_H	Accuracy	SYNAME	SITE_NAM	COSEWIC_	PROVINCI	SARA	Sources
Loxia curvi	Red Crossl	J. Wells	5	23	1971	S2S3	N5	G5	At Risk	Fringillidae	boreal fore	4		Salmonier	Endangere	Endangere	Endangere	Nest Record Card
Euphagus	Rusty Blac	Michael Pa	8	4	2005	S3B	N4B	G4	Secure	Icteridae		3		Salmonier	Special Co	Vulnerable	Special Co	NF.Birds
Pagophila	Ivory Gull		1	13	1998	S2N	N3B,N4N	G5	May Be At	Laridae		3		Salmonier	Endangere	Endangere	Endangere	NF.Birds

GNAME	GCOMNAM	OBSERVE	MONTH	DAY	YEAR	SRANK	NRANK	GRANK	GeneralSta	FAMILY	DESCR_H	ACCURAC	SYNAME	SITE_NAM	COSEWIC_	PROVINCI	SARA	ACRONYM	COLLECTI	SOURCES
Isoetes aca	Acadian qu	Britton & A	7	28	1982	S1	N1N2	G2G3		Isoetaceae	Gravelly and mucky bottom in sha			Deer Park,	Candidate	(Priority 1)		OAC		

GNAME	GCOMNAME	OBSERVER	MONTH	YEAR	SRANK	NRANK	GRANK	GeneralStatusRanks	SITE_NAME	COSEWIC_STATUS	PROVINCIAL_STATUS	SARA
Erioderman pedicellatum	Boreal Felt Lichen	Hanel, Claudia; et al.	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Hanel, Claudia; et al.	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Hanel, Claudia; et al.	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Hanel, Claudia; et al.	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Hanel, Claudia; et al.	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Roberts, Bruce A.; Clarke, Bill	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Roberts, Bruce A.; Clarke, Bill	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Roberts, Bruce A.; Clarke, Bill	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Keeping, Brent; Gullage, Stephen	11	2006	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen		0	1996	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	0	1997	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	11	1998	S3	N1	G1G2Q	Sensitive	Salmonier Nature Park	Special Concern	Vulnerable	Special Concern

Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	0	1996	S3	N1	G1G2Q	Sensitive	Avalon Peninsula_Placentia	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	0	1996	S3	N1	G1G2Q	Sensitive	Avalon Peninsula_Placentia	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	0	1996	S3	N1	G1G2Q	Sensitive	Avalon Peninsula_Placentia	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	0	1996	S3	N1	G1G2Q	Sensitive	Avalon Peninsula_Placentia	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Pitcher, Mac	0	1996	S3	N1	G1G2Q	Sensitive	Avalon Peninsula_Placentia	Special Concern	Vulnerable	Special Concern
Erioderman pedicellatum	Boreal Felt Lichen	Newfoundland Department of Forestry	0	1999	S3	N1	G1G2Q	Sensitive	Eastern Waters	Special Concern	Vulnerable	Special Concern

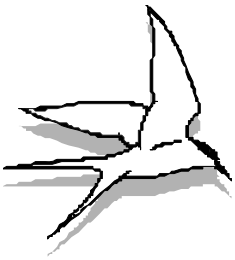
DATA DICTIONARY

GNAME	Scientific Name of taxon
GCOMNAME	Common name of taxon
FAMILY	Family of taxon
OBSERVER	Person or persons who observed the taxon
TOTAL NUMBER	The number of specimens at a given observation.
MONTH	Month of survey
DAY	Day of survey
YEAR	Year of survey
SRANK	Subnational rank - CDC ranking system
NRANK	National Rank - CDC ranking system
GRANK	Global Rank - CDC ranking system
GeneralStatusRanks	General Status text for the province in 2005
COSEWIC_STATUS	Denotes the COSEWIC status.
PROVINCIAL_STATUS	Denotes if the species is on the provincial endangered species list.
SARA	Denotes if the species is on the federal SARA list.
HABITAT	Description of the habitat where plant or animal was found
ACCURACY	The accuracy in metres of the location.
SYNAME	Synonym for the plant or animal name in cases it is known by more than one scientific name.
ACRONYM OF HERBARIA	Acronym of the herbarium where this specimen is kept, see the complete definitions of the acronyms in the HERBARIA.xls
COLLECTION NUMBER	The collection number assigned to the specimen by the collector, this should be used to refer to the specimen when contacting the herbarium
CITATION	Primary source of the data
IDNUM	Field Office Number: Internal ACCDC record reference (not the EONUM)

ACRONYM	HERBARIUM	ADDRESS	PO_BOX	CITY	PROVINCE	POSTALCODE	COUNTRY	URL	PHONE	CORRESPONDENT	TITLE	EMAIL
ACAD	Acadia University	32 University Avenue	P.O. Box 48	Wolfville	Nova Scotia	B4P 2R6	Canada		[1] 902/ 585-1335	Ruth Newell	Curator	ruth.newell@acadiau.ca
ALTA	University of Alberta			Edmonton	Alberta	T6G 2E9	Canada	http://museums.ualberta.ca/vascularplants/index.aspx	[1] 780/ 492-5523	Jocelyn Hall	Curator of Vascular Plant Herbarium	jocelyn.hall@ualberta.ca
CAN	Canadian Museum of Nature		P.O. Box 3443 Station D	Ottawa	Ontario	K1P 6P4	Canada		[1] 613/ 364-4076.	Jennifer Doubt	Chief Collection Manager	jdoubt@mus-nature.ca
CO	Museum National d'Histoire Naturelle		B.P. 225	Concarneau		F-29125	France		[33] 2/ 98 97 0659	Marie Le Gal	Curator	ylegal@sb-roscoff.fr
DAO	Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada	Wm. Saunders Building, Central Experimental Farm		Ottawa	Ontario	K1A 0C6	Canada	http://res2.agr.ca/ecorc/dao/index_e.htm	[1] 613/ 759-1373	Paul Catling	Curator	catlingp@agr.gc.ca
FFB	Atlantic Forestry Centre	1350 Regent Street Centre, Canadian Forest Service	P. O. Box 4000	Fredricton	New Brunswick	E3B 5P7	Canada	http://www.Atl.cfs.NRCan.gc.ca	[1] 506/ 452-3515	J. Hurley	Curator	J.Edward.Hurley@NRCan.gc.ca
GH	Gray Herbarium, Harvard University	22 Divinity Avenue		Cambridge	Massachusetts	02138-2020	USA	http://www.huh.harvard.edu	[1] 617/ 495-2365	Emily Wood	Manager of Systematics Collections	ewood@oeb.harvard.edu
GMNP	Gros Morne National Park		P.O. Box 130	Rocky Harbour	Newfoundland	A0K 4N0	Canada		[1] 709/ 458-2418	Michael Burzunski	Chief Park Interpreter	Michael.Burzynski@pc.gc.ca
H	University of Helsinki		P.O. Box 7	Helsinki		FIN-00014	Finland	http://www.fmnh.helsinki.fi/english/botany/index.htm	[358] 9/ 1911	Pertti Uotila	Director, Head Curator of Phanerogams	pertti.uotila@helsinki.fi
LD	Botanical Museum	Östra Vallgatan 18		Lund		S-223 61	Sweden	http://www.biomus.lu.se/indexBe.html	[46] 46/ 222 95 58	Ingvar Kärnefelt	Director	ingvar.karnefelt@botmus.lu.se
MB	Herbarium fur Spezielle Botanik, Philipps Universitat			Marburg		D-35032	Germany	http://staff-www.uni-marburg.de/	[49] 6421/ 282 2091	Hans Weber	Curator	weberh@mailer.uni-marburg.de
MO	Missouri Botanical Gardens		P.O. Box 299	St. Louis	Missouri	63166-0299	USA	http://www.mobot.org/	[1] 314/ 577-5169	James Solomon	Curator of Vascular Plants	jim.solomon@mobot.org
MT	Herbier Marie-Victorin, Universite de Montreal	4101, rue Sherbrooke est		Montreal	Quebec	H1X 2B2	Canada	http://www.irbv.umontreal.ca/francais/herbier/accueil.htm	[1] 514/ 872-8496	Luc Brouillet	Curator	brouille@irbv.umontreal.ca; luc.brouillet@umontreal.ca
NASC	Massachusetts College of Liberal Arts	375 Church Street		North Adams	Massachusetts	01247-4100	USA		[1] 413/ 662-5342	C. Hellquist	Curator of Vascular Plants	bhellqui@mcla.mass.edu
NFLD	Ayre Herbarium, Memorial University of Newfoundland			St. John's	Newfoundland	A1B 3X9	Canada		[1] 709/ 737-7498	Peter Scott	Curator	pscott@mun.ca
NFM	Provincial Museum of Newfoundland and Labrador	9 Bonaventure Avenue	P.O. Box 1800	St. John's	Newfoundland	A1C 5P9	Canada	http://www.therooms.ca/museum/	[1] 709/ 729-5007	Nathalie Djan-Chekar	Curator	nathaliedjanchekar@therooms.ca

ACRONYM	HERBARIUM	ADDRESS	PO_BOX	CITY	PROVINCE	POSTALCODE	COUNTRY	URL	PHONE	CORRESPONDENT	TITLE	EMAIL
NY	New York Botanical Garden	William and Lynda Steere Herbarium		Bronx	New York	10458-5126	USA	http://www.nybg.org/	[1] 718/ 817-8626	Barbara Thiers	Director	bthiers@nybg.org
OAC	Univeristy of Guelph			Guelph	Ontario	N1G 2W1	Canada	http://www.uoguelph.ca/ib/facilities/herbarium.shtml	[1] 519/ 824-4120, ext. 58581	Carole Ann Lacroix	Curator of Phanerogam Collections	botcal@uoguelph.ca
QFA	Herbier Louis-Marie, Universite de Laval	Pavillon C.-E. Marchand Sainte-Foy		Quebec	Quebec	G1V 0A6	Canada	www.herbier.ulaval.ca	[1] 418/ 656-7538	Serge Payette	Curator	serge.payette@herbier.ulaval.ca
SLRO	Slippery Rock University	Herbarium Biology Department		Slippery Rock	Pennsylvania	16057-1326	USA		[1] 724/ 738-2489	Jerry Chmielewski	Curator	jerry.chmielewski@sru.edu
SWGC	Sir Wilfred Grenfell College			Corner Brook	Newfoundland		Canada			Henry Mann		hmann@swgc.mun.ca
TNNP	Terra Nova National Park			Terra Nova	Newfoundland		Canada			Greg Stroud		Greg.Stroud@pc.gc.ca
TRTE	Erindale College	Herbarium Department of Biology, 3359 Mississauga Road, N		Mississauga	Ontario	L5L 1C6	Canada		[1] 905/ 828-3984	Peter Ball	Curator	pball@credit.erin.utoronto.ca
TSM	Museo Civico di Storia Naturale	Piazza Hortis 4		Trieste		I-34123	Italy		[39] 040/ 6758658	Sergio Dolce	Director	dolces@comune.trieste.it
UAC	University of Calgary	Department of Biological Sciences		Calgary	Alberta	T2N 1N4	Canada		[1] 403/ 220-5262	C. Chinnappa	Curator	ccchinna@acs.ucalgary.ca
UBC	UBC Herbarium, Beaty Biodiversity Museum	3529-6270 University Boulevard		Vancouver	British Columbia	V6T 1Z4	Canada	http://www.beatymuseum.ubc.ca/herbarium/index.html	[1] 604/ 822-3344; 822-2133.	Jeannette Whitton	Director and Curator of Vascular Plants	jwhitton@interchange.ubc.ca
UNB	University of New Brunswick	Connell Memorial Herbarium Biology Department	P.O. Box 4400	Fredricton	New Brunswick	E3B 5AE	Canada	http://www.unb.ca/herbarium/	[1] 506/ 452-6205	Bev Benedict	Curator of Vascular Plants	bbenedic@unb.ca
US	Smithsonian Institute	United States National Herbarium Department of Botany NMNH, MRC-166	P.O. Box 37012	Washington	District of Columbia	20013-7012	USA	http://www.nmnh.si.edu/sysbiology/	[1] 202/ 633-0920.	George Russell	Collections Manager	russellr@si.edu
UWO	University of Western Ontario	Herbarium, Department of Biology		London	Ontario	N6A 5B7	Canada		[1] 519/ 661-2111	Jane Bowles	Curator	jbowles@uwo.ca
WAT	University of Waterloo	Herbarium, Biology Department		Waterloo	Ontario	N2L 3G1	Canada	http://www.science.uwaterloo.ca/biology/	[1] 519/ 888-4567, ext. 3751	John Semple	Director	jcsemple@sciborg.uwaterloo.ca

NOTE: All contact information presented here has been extracted from the online Herbaria of the World Index, url: http://sweetgum.nybg.org/ih/index.php for more information please visit the url provided.



Atlantic Canada CDC Canada Atlantique

2004 Edition

Part I. Conservation Data Centre Subnational Rarity Ranks

Biological diversity or biodiversity can be described at a number of levels, from molecules to ecosystems. Biodiversity is a combination of species diversity (the variety of species), genetic diversity (the genetic variability among individuals of that species), and ecological diversity (the variety of ecosystems/habitats in which they live). Conservation Data Centres (CDCs), as part of The NatureServe* international network, track biodiversity at two levels: species and ecological communities. Species and ecological communities are referred to as **elements** of biodiversity. Elements are ranked in each jurisdiction (province or state) and at global and national levels in order to help prioritise conservation efforts.

NatureServe and all CDCs (called Heritage Programs in the US) use a standardised element ranking system that has evolved over some 30 years, with input from hundreds of scientists, managers and conservationists. The following material describes this element ranking system at the subnational (S) or provincial level and explains how ranks are assigned for species elements of biodiversity. (The community ranking process is slightly different.)

* Formerly known as The Nature Conservancy (TNC)

Definitions of Provincial (subnational) ranks - SRANKS

S1 Extremely rare throughout its range in the province (typically 5 or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.

S2 Rare throughout its range in the province (6 to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.

S3 Uncommon throughout its range in the province, or found only in a restricted range, even if abundant in at some locations. (21 to 100 occurrences).

S4 Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the Element is of long-term concern (e.g. watch list). (100+ occurrences).

S5 Demonstrably widespread, abundant, and secure throughout its range in the province, and essentially ineradicable under present conditions.

S#S# Numeric range rank: A range between two consecutive numeric ranks. Denotes range of uncertainty about the exact rarity of the Element (e.g., S1S2).

SH Historical: Element occurred historically throughout its range in the province (with expectation that it may be rediscovered), perhaps having not been verified in the past 20 - 70 years (depending on the species), and suspected to be still extant.

SU Unrankable: Possibly in peril throughout its range in the province, but status uncertain; need more information.

SX Extinct/Extirpated: Element is believed to be extirpated within the province.

S? Unranked: Element is not yet ranked.

SA Accidental: Accidental or casual in the province (i.e., infrequent and far outside usual range). Includes species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds or even thousands of miles outside their usual range; a few of these species may even have bred on the one or two occasions they were recorded.

SE Exotic: An exotic established in the province (e.g., Purple Loosestrife or Coltsfoot); may be native in nearby regions.

SE# Exotic numeric: An exotic established in the province that has been assigned a numeric rank.

SP Potential: Potential that Element occurs in the province, but no occurrences reported.

SR Reported: Element reported in the province but without persuasive documentation which would provide a basis for either accepting or rejecting (e.g., misidentified specimen) the report.

SRF Reported falsely: Element erroneously reported in the province and the error has persisted in the literature.

SZ Zero occurrences: Not of practical conservation concern in the province, because there are no definable occurrences, although the species is native and appears regularly. An NZ rank will generally be used for long distance migrants whose occurrences during their migrations are too irregular (in terms of repeated visitation to the same locations) or transitory. In other words, the migrant regularly passes through the province, but enduring, mappable Element Occurrences cannot be defined.

Qualifiers

Breeding Status

B Breeding: Basic rank refers to the breeding population of the element in the province.

N Non-breeding: Basic rank refers to the non-breeding (usually wintering) population of the element in the province.

M Migratory: Basic rank refers to the migratory stopover population in the province.

Other Qualifiers:

? Inexact or uncertain: for numeric ranks, denotes inexactness, e.g., SE? denotes uncertainty of exotic status. (The "?" qualifies the character immediately preceding it in the SRANK)

C Captive or cultivated: Element is presently extant in the country or province only in captivity or cultivation.

Part II. The Ranking Process

To rank species elements, eight different biological criteria are assessed for each species. A letter value from A to D is assigned to each biological factor for which there is enough information. A species with all **A**s will likely be ranked S1 whereas a species with all **D**s would likely receive a S5. Where there is a mixture of letter ranks, the person doing the ranking must use their judgment to decide how much weight should be given to certain factors, depending on the biology of the species in question. The eight factors considered in assigning status ranks are described below. Following this there is a matrix (Table 1) summarising the guidelines for scoring (A-D) the eight criteria.

Ranking Matrix Eight ranking criteria and value of letter scores for each criterion.

	MATRIX SCORE			
	A	**B**	**C**	**D**
CRITERIA				
Population size	<1000	1000-3000	3000-10,000	> 10,000
Geographic Distribution	<4% of province	4-10% of province	11-50% of province	>50% of province
Population Trend	Rapid decline (>50% in 10 yrs)	Decline (>20% in 10 yrs)	Stable (natural fluctuation)	Increasing
Distribution Trend	Rapid Decline	Decline	Stable	Increasing
Number of Element Occurrences	0-5	6-20	21-100	>100
Number of protected EOs	Believed to be none	At least one	Several	Many
Threats to population	Extreme	Moderate	Limited	None
Threats to habitat	Extreme	Moderate	Limited	None

1. Provincial Abundance

A single letter code represents the estimated provincial abundance of the species. Abundance is measured in different ways depending on the biology of the species. For animal populations it is usually measured by the number of individuals, for plants it may be measured by the area

occupied by a distinct population, and for aquatic invertebrates it may be measured by the stream length that the species occupies:

A = Fewer than 1,000 individuals *or*
Fewer than 10 miles of stream length *or*
fewer than 800 ha

B = 1,000 - 3,000 individuals *or*
10 - 50 miles of stream length *or*
800 - 4000 ha

C = 3,000 - 10,000 individuals *or*
50 - 250 miles of stream length *or*
4,000 to 20,000 ha

D = over 10,000 individuals *or*
over 250 miles of stream length *or*
over 20,000 ha

2. Provincial Range

This denotes the approximate range of the species as a percentage of the province's area. It is defined as the current area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of occurrence, but, *excluding* significant areas where the species does not occur due to unsuitable habitat. Thus the estimate of range for a species exhibiting a linear use of coastal forests or riverine habitats would not consider tracts of unsuitable habitat in the interior of the polygon.

A = Very small range, less than 3% of province
B = Narrow range, less than 10% of province
C = Moderately widespread, less than half of province
D = Widespread, more than half of province

3. Population Abundance Trend

Population Abundance Trend is an estimate of the change in the number of mature individuals over time, from long term monitoring data and historical accounts, where available. Natural fluctuations will not normally count as part of a decline. An observed decline should not be considered as part of a natural fluctuation unless there is evidence for this.

A = Declining rapidly (decrease of 50 % in the last 10 years or 3 generations, whichever is longer)
B = Declining (decrease of 20 % in the last 10 years…)
C = Stable
D = Increasing

4. Distribution Trend

A single-letter code which best characterizes the trend in the species' distribution over its provincial range:

A = Declining rapidly (decrease of 50 % in the last 20 years or 6 generations, whichever is longer)
B = Declining (decrease of 20 % in the last 20 years…)
C = Stable
D = Increasing

5. Number of Element Occurrences (EOs)

An “element occurrence” is the mapping unit of CDC methodology. It is generally defined as an area of land or water on which an “element of biodiversity” (plant and animal species or natural community) is or was present. It is a physical location important to the conservation of a species or community, an area worth preserving to insure the survival of a community or species at risk. For a species it is generally the habitat occupied by a local population, for a community it is the area containing a stand or patch. What constitutes an occurrence also varies between species

(e.g. hibernacula, den sites, breeding ponds where adults, egg masses and/or larvae have been identified, breeding colonies, etc.). Some species can have more than one type of occurrence, for example breeding and wintering occurrences.

A single letter code (below) represents the number of estimated occurrences believed extant for the species in the province. When a species' distribution is extremely limited and there are very few site occurrences, it is very susceptible to any number of ecological disturbances, both predictable and unpredictable. This criteria is therefore an important factor influencing SRANK when the number of occurrences is few. If the letter code for this field is A or B, the species usually qualifies for a rank of S1 or S2.

A = 0 - 5 occurrences
B = 6 - 20 occurrences
C = 21 - 100 occurrences
D = 101+ occurrences

6. Number of Protected Element Occurrences

The estimated number of adequately protected occurrences of the species in the province.

A = Believed to be none protected.
B = At least one protected occurrence.
C = Several protected occurrences.
D = Many protected occurrences.
U = Unknown whether any occurrence protected.

7. Threats to Population

Threats to population include observed, inferred or projected 1) direct exploitation, 2) harassment, or 3) ecological interactions with predators, competitors, pathogens or parasites - which may result in population declines. Threats may arise from natural or man-made forces.

A = Very threatened in the province; threats are of high magnitude (affect more than half the population) and imminent; unmitigated.
B = Moderately threatened province-wide (less than half the population); threats imminent; mitigated by some level of human protection.
C = Not very threatened province-wide; threats not so imminent; threat is less significant to population viability; threats are being mitigated through protective measures.
D = Unthreatened on a province-wide basis, although it may be threatened in minor portions of the province.

8. Threats to Habitat

Threats to habitat include observed, inferred or projected habitat alterations (loss, conversion, degradation or fragmentation) which may result in population declines or loss of element occurrences.

- **A** = Very threatened in the province (affects more than half the provincial range); threats are of high magnitude and imminent; unmitigated.
- **B** = Moderately threatened province-wide (affects less than half the provincial range); threats imminent; mitigated by some level of human protection.
- **C** = Not very threatened province-wide; threats not so imminent; threat is less significant to population viability; threats are being mitigated through protective measures.
- **D** = Unthreatened on a province-wide basis, although it may be threatened in minor portions of the province.

9. Other Considerations

Other considerations in determining the rank that are not apparent from the letter codes selected for the above criteria. Generally, these considerations will raise rather than lower the rank, e.g., "Never sexually reproduces" or "All occurrences are in areas under development".

APPENDIX E

ECOLOGICAL RISK ASSESSMENT TABLES

Table E1: Physio-Chemical Characterization of Pesticides in Sediment

Constituent	Units	ISQG [1]	PEL [1]	Source [2]	Number of samples	FOD [3]	95% UCL	Max detected	Max/ISQG	Max / PEL	95% UCL/ISQG	95% UCL/PEL	Risk to Benthos?
4,4'-DDE	ug/g	1.42	6.75	CCME	28	4%	0.70	1.60	**1.13**	0.24	0.49	0.10	No
a-chlordane	ug/g	4.5	8.87	CCME	28	4%	0.89	2.70	0.60	0.30	0.20	0.10	No
Aldrin	ug/g	2.85	6.87	Used dieldrin	28	7%	0.48	1.11	0.39	0.16	0.17	0.07	No
Dichlofluanid	ug/g	190	570	Dutch	28	11%	2.92	7.80	0.04	0.01	0.02	0.01	No
Dieldrin	ug/g	2.85	6.87	CCME	28	4%	0.31	0.57	0.20	0.08	0.11	0.05	No
g-chlordane	ug/g	4.5	8.87	CCME	28	4%	0.82	2.30	0.51	0.26	0.18	0.09	No
Heptachlor	ug/g	248	744	USEPA - see text	28	11%	1.71	6.70	0.03	0.01	0.01	0.00	No
Heptachlor epoxide	ug/g	5280	15840	USEPA - see text	28	4%	1.06	3.60	0.00	0.00	0.00	0.00	No
Hexachlorobenzene	ug/g	Not Toxic	Not toxic	See text	28	4%	0.64	1.20	0.00	0.00	0.00	0.00	No
Pentachloronitrobenzene	ug/g	13	30	USEPA - see text	28	4%	1.41	1.40	0.11	0.05	0.11	0.05	No
Profenophos	ug/g	77	231	USEPA - see text	28	4%	1.44	1.80	0.02	0.01	0.02	0.01	No
Propazine	ug/g	3850	11550	USEPA - see text	28	7%	1.70	3.40	0.00	0.00	0.00	0.00	No

Notes:

(1) Values are either ISQG and PEL values or values from other sources that have the same implications as ISQG and PELs

(2) Canadian Council of Ministers of the Environment Sediment Quality Guidelines, Updated 2011
Dutch: Crommentuijn, T., M.D. Polder, and E.J. van de Plassche, 1997. Maximum permissible concentrations and negligible concentrations for metals, taking into account background. Report #601501.001, National Institute of Public Health and the Environment, Bilthoven, The Netherlands.
USEPA, 2003. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks for the Protection of Benthic Organisms: Dieldrin, United States Environmental Protection Agency, August 2003

(3) FOD = Frequency of Detection

Table E2. Indicator Species and Parameters for Food Chain Models.

Species	Body Weight, Kg.	Ecological guild	Contaminated Prey	Feeding Rate (kg WW / kw BW-day)	Soil Ingestion (kg DW / kg BW-day)
Short-tailed Shrew	0.015	Primary Predator	Worms, insects	0.53	0.014
Robin	0.08	Omnivore	Worms, plants	0.44	0.014
Meadow Vole	0.044	Herbivore	Plants, fruits, seeds	0.325	0.002
Pine Grosbeak	0.05	Herbivore	Plants, seeds	0.66	0.004
Ermine	0.1	Top Predator	Small vert.	0.33	0.001
Red Fox	4.035	Top predator	Small vert.	0.1	0.001
Red-tailed hawk	1.2	Top predator	Small vert.	0.1	0.001
Brown Bat	0.007	Aerial Insectivore	Adult Aquatic Insects	0.333	0.000
Tree Swallow	0.02	Aerial Insectivore	Adult Aquatic Insects	0.755	0.000
Mink	0.97	Piscivore	Medium Fish	0.156	0.002
Great Blue Heron	2.2	Piscivore	Medium Fish	0.18	0.004
Kingfisher	0.15	Piscivore	Small fish	0.5	0.004
Raccoon	7	Herbivore/Benthivore	Benthic Invert.	0.2	0.005
Mallard	1.04	Herbivore/Benthivore	Benthic Invert.	0.17	0.003

Notes:

WW, "DW", and "BW" refer to wet weight, dry weight, and body weight.

Parameters from EPA (1993a) or EPA (1999) except for bat, which were obtained from Baron et al. 1999.

Ermine parameters based on long tailed weasel

Table E3. Mammal and Bird Toxicity Reference Values (TRVs)

Constituent	TRV for Mammals				TRV for Birds			
	Test Species	NOAEL	LOAEL	Source [1]	Test Species	NOAEL	LOAEL	Source [1]
Chlordane	Mouse	4.60E+00	9.20E+00	a	Redwing Blackbird	2.14E+00	1.07E+01	a
DDT and metabolites	Rat	1.47E-01	7.35E-01	b	Chicken	0.227	2.23E+00	b
Dieldrin	Rat	2.00E-02	2.00E-01	a	Barn Owl	7.70E-02	7.70E-01	a
Heptachlor epoxide	Beagle dog	1.25E-02	1.25E-01	c	Quail	5.00E-01		d
Hexachlorobenzene	Mink	4.20E-02	1.05E-01	e	Quail	1.10E+00		f
Methoxychlor	Rat	4.00E+00	8.00E+00	a	Robin	3.75E+01		g

Notes:

(1) a. Sample et al., 1996
b. EPA, 2007
c. EPA IRIS, 1991
d. Hill et al., 1975
e. Bleavins et al., 1984
f. Vos et al., 1971
g. Hunt and Sacho, 1969

Table E4. Concentrations of Dieldrin in Soil, Worms, Plants and Small Mammals (mg/kg)

	N [1]	Max	95% UCL	Mean
Soil				
With 2004 data	60	4.50	0.37	0.22
Without 2004 data	54	1.00	0.09	0.05
Concentrations in Worms				
With 2004 data		1.53	0.13	0.07
Without 2004 data		0.34	0.03	0.02
Concentrations in Plants				
With 2004 data		0.07	0.01	0.00
Without 2004 data		0.02	0.00	0.00
Concentrations in Small Mammals				
With 2004 data		0.43	0.04	0.02
Without 2004 data		0.10	0.01	0.00

Notes:
(1) Number of samples

Table E5. Assessment of Risk to Terrestrial VEC Mammals from Dieldrin in Soil and Foods.

Constituent	Toxicity Reference Value, (mg/kg/day)	Feeding Rate, (kg/kg-day)	95% UCL Conc. Predicted in Food (mg/kg)	Mean Conc. Predicted in Food (mg/kg)	95% UCL Dose (mg/kg/day)	Mean. Dose, (mg/kg/day)	**95% UCL HQ**	**Mean HQ**
Shrew eating 100% worms								
With 2004 Data	0.02	0.57	0.127	0.075	0.073	0.043	**3.6**	**2.1**
Without 2004 Data	0.02	0.57	0.030	0.017	0.017	0.010	0.9	0.5
Robin eating 50% worm diet, 50% veg								
With 2004 Data	0.07	0.25	0.127	0.075	0.033	0.020	0.5	0.3
Without 2004 Data	0.07	0.25	0.030	0.017	0.008	0.004	0.1	0.1
Mouse eating 100% veg								
With 2004 Data	0.02	0.50	0.006	0.003	0.003	0.002	0.0	0.0
Without 2004 Data	0.02	0.50	0.001	0.001	0.001	0.000	0.0	0.0
Pine Grosbeak eating 100% veg								
With 2004 Data	0.07	0.66	0.0056	0.0033	0.004	0.002	0.1	0.0
Without 2004 Data	0.07	0.66	0.0013	0.0008	0.001	0.000	0.0	0.0
Ermine eating 100% small vertebrates								
With 2004 Data	0.02	0.33	0.04	0.02	0.012	0.007	0.2	0.1
Without 2004 Data	0.02	0.33	0.01	0.00	0.003	0.002	0.0	0.0
Red fox eating 100% small vertebrates								
With 2004 Data	0.02	0.10	0.0360	0.0212	0.004	0.002	0.1	0.0
Without 2004 Data	0.02	0.10	0.0085	0.0048	0.001	0.000	0.0	0.0
Red Tailed Hawk eating 100% small vertebrates								
With 2004 Data	0.07	0.10	0.0360	0.0212	0.004	0.002	0.1	0.0
Without 2004 Data	0.07	0.10	0.0085	0.0048	0.001	0.000	0.0	0.0

Note: TRV values listed are based on No-observed Adverse Effect Level (NOAEL)

Table E6. Assessment of Risk to Piscivorous Wildlife: Mink, Kingfisher, and Great Glue Heron.

Constituent	Toxicity Reference Value, (mg/kg/day)	Feeding Rate, (mg/kg/day)	Max. Conc. Predicted in Fish (mg/kg)	95% UCL Conc. In Fish (mg/kg)	Max Dose (mg/kg/day)	95% UCL Dose (mg/kg/day)	Max. HQ	95% UCL HQ
	Mink							
Total Chlordane	4.60	0.16	0.0026	0.0009	0.0004	0.0001	0.00	0.00
Total DDT	0.15	0.16	0.0115	0.0053	0.0018	0.0008	0.01	0.01
Diedrin	0.02	0.16	0.0111	0.0055	0.0018	0.0009	0.09	0.04
Heptachlor Epoxide	0.01	0.16	0.0003	NA	0.0000	NA	0.00	NA
Hexachlorobenzene	0.04	0.16	0.0004	0.0002	0.0001	0.0000	0.00	0.00
Methoxychlor	4.00	0.16	0.0007	0.0005	0.0001	0.0001	0.00	0.00
	Kingfisher							
Total Chlordane	2.14	0.50	0.0026	0.0009	0.0013	0.0005	0.00	0.00
Total DDT	0.227	0.50	0.0115	0.0053	0.0057	0.0026	0.03	0.01
Dieldrin	0.08	0.50	0.0111	0.0055	0.0056	0.0028	0.07	0.04
Heptachlor Epoxide	0.5	0.50	0.0003	NA	0.0001	NA	0.00	NA
Hexachlorobenzene	1.10	0.50	0.0004	0.0002	0.0002	0.0001	0.00	0.00
Methoxychlor	37.50	0.50	0.0007	0.0005	0.0004	0.0003	0.00	0.00
	Great Blue Heron							
Total Chlordane	2.14	0.18	0.0026	0.0009	0.0005	0.0002	0.00	0.00
Total DDT	0.227	0.18	0.0115	0.0053	0.0021	0.0009	0.01	0.00
Dieldrin	0.08	0.18	0.0111	0.0055	0.0020	0.0010	0.03	0.01
Heptachlor Epoxide	0.5	0.18	0.0003	NA	0.0001	NA	0.00	NA
Hexachlorobenzene	1.10	0.18	0.0004	0.0002	0.0001	0.0000	0.00	0.00
Methoxychlor	37.50	0.18	0.0007	0.0005	0.0001	0.0001	0.00	0.00

Note: TRV values listed are based on No-observed Adverse Effect Level (NOAEL)
NA - Not applicable as only one sample contained a detectable concentration

Table E7. Assessment of Risk to Insectivorous Wildlife: Raccoon and Mallard.

Constituent	Toxicity Reference Value, (mg/kg/day)	Feeding Rate, (mg/kg/day)	Max. Conc. Predicted in Benthos (mg/kg)	95% UCL Conc. In Benthos (mg/kg)	Max. dose (mg/kg/day)	95% UCL dose (mg/kg/day)	Max. HQ	95% UCL HQ
	Raccoon							
Total Chlordane	4.60	0.10	0.0026	0.0009	0.0003	0.0001	0.00	0.00
Total DDT	0.15	0.10	0.0115	0.0053	0.0011	0.0005	0.01	0.00
Diedrin	0.02	0.10	0.0111	0.0055	0.0011	0.0006	0.06	0.03
Heptachlor Epoxide	0.01	0.10	0.0003	NA	0.0000	NA	0.00	NA
Hexachlorobenzene	0.04	0.10	0.0004	0.0002	0.0000	0.0000	0.00	0.00
Methoxychlor	4.00	0.10	0.0007	0.0005	0.0001	0.0001	0.00	0.00
	Mallard							
Total Chlordane	2.14	0.09	0.0026	0.0009	0.0002	0.0001	0.00	0.00
Total DDT	0.227	0.09	0.0115	0.0053	0.0010	0.0004	0.00	0.00
Dieldrin	0.08	0.09	0.0111	0.0055	0.0009	0.0005	0.01	0.01
Heptachlor Epoxide	0.5	0.09	0.0003	NA	0.0000	NA	0.00	NA
Hexachlorobenzene	1.10	0.09	0.0004	0.0002	0.0000	0.0000	0.00	0.00
Methoxychlor	37.50	0.09	0.0007	0.0005	0.0001	0.0000	0.00	0.00

Note:
TRV values listed are based on No-observed Adverse Effect Level (NOAEL)
Feeding rates have been halved as each species is half vegetarian.
NA - Not applicable as only one sample contained a detectable concentration

Table E8. Assessment of Risk to Aerial Insectivores: Bat and Tree Swallow

Constituent	Toxicity Reference Value, (mg/kg/day)	Feeding Rate, (mg/kg/day)	Max. Conc. Predicted in Insects (mg/kg)	95% UCL Conc. In Insects (mg/kg)	Max. dose (mg/kg/day)	95% UCL dose (mg/kg/day)	Max. HQ	95% UCL HQ
	Bat							
Total Chlordane	4.60	0.33	0.0026	0.0009	0.0009	0.0003	0.00	0.00
Total DDT	0.15	0.33	0.0115	0.0053	0.0038	0.0017	0.03	0.01
Diedrin	0.02	0.33	0.0111	0.0055	0.0037	0.0018	0.18	0.09
Heptachlor Epoxide	0.01	0.33	0.0003	NA	0.0001	NA	0.01	NA
Hexachlorobenzene	0.04	0.33	0.0004	0.0002	0.0001	0.0001	0.00	0.00
Methoxychlor	4.00	0.33	0.0007	0.0005	0.0002	0.0002	0.00	0.00
	Tree Swallow							
Total Chlordane	2.14	0.77	0.0026	0.0009	0.0020	0.0007	0.00	0.00
Total DDT	0.227	0.77	0.0115	0.0053	0.0088	0.0041	0.04	0.02
Dieldrin	0.08	0.77	0.0111	0.0055	0.0085	0.0043	0.11	0.06
Heptachlor Epoxide	0.5	0.77	0.0003	NA	0.0002	NA	0.00	NA
Hexachlorobenzene	1.10	0.77	0.0004	0.0002	0.0003	0.0002	0.00	0.00
Methoxychlor	37.50	0.77	0.0007	0.0005	0.0006	0.0004	0.00	0.00

Note: TRV values listed are based on No-observed Adverse Effect Level (NOAEL)

APPENDIX F

HUMAN HEALTH RISK ASSESSMENT TABLES

TABLE F.1

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SOIL
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6, 7)	COPC Flag	Rationale for Contaminant Deletion or Selection (8)
	BTEX													
71-43-2	Benzene	0.082		0.082		µg/g	EX1-SS3; 1.2-2.1 mbgs (06/29/04)	1/26	0.025	0.082	0.03	4	X	ASS
108-88-3	Toluene	0.657		0.657		µg/g	EX1-SS3; 1.2-2.1 mbgs (06/29/04)	1/26	0.025	0.657	0.38	4	X	ASS
100-41-4	Ethylbenzene	0.19		0.975		µg/g	EX1-SS1; 1-2 mbgs (06/29/04)	4/26	0.025	0.975	0.08	4	X	ASS
1330-20-7	Xylenes (total)	0.0502		9.39		µg/g	EX1-SS3; 1.2-2.1 mbgs (06/29/04)	4/26	0.05	9.39	11	4		BSS; DLBSS
	TPH													
--	Modified TPH (gas source)	ND		ND		µg/g	--	0/14	32	32	39	4		DLBSS
--	Modified TPH (fuel oil source)	76		4400		µg/g	EX1-SS3; 1.2-2.1 mbgs (06/29/04)	8/22	32	4400	140	4	X	ASS
--	Modified TPH (lube oil source)	54		440		µg/g	TP3-SS1; 0-1 mbgs (06/29/04)	4/18	32	440	690	4		BSS; DLBSS
	Pesticides													
789-02-6	2,4'-DDD	ND		ND		µg/g	--	0/74	0.01 - 0.02	0.02	--	--		ND
3424-82-6	2,4'-DDE	ND		ND		µg/g	--	0/74	0.01 - 0.02	0.02	--	--		ND
--	2,4'-DDT + 4,4'-DDD	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	--	--		ND
72-55-9	4,4'-DDE	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	23	6		DLBSS
50-29-3	4,4'-DDT	ND		ND		µg/g	--	0/74	0.02 - 0.04	0.04	23	6		DLBSS
2132-70-9	4,4'-methoxychlor	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
319-84-6	a-BHC	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	0.77	7		DLBSS
30560-19-1	Acephate	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	560	7		DLBSS
5103-71-9	a-Chlordane	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	5.9	6, 9		DLBSS
15792-50-8	Alachlor	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	87	7		DLBSS
309-00-2	Aldrin	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	0.56	6		DLBSS
3244-90-4	Aspon	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	--	--		ND
1912-24-9	Atrazine	ND		ND		µg/g	--	0/80	0.03 - 0.06	0.06	21	7		DLBSS
86-50-0	Azinophos methyl (Guthion)	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
2642-71-9	Azinphos ethyl	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND

TABLE F.1

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SOIL
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6, 7)	COPC Flag	Rationale for Contaminant Deletion or Selection (8)
	Pesticides (cont.'d)													
319-85-7	b-BHC	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	2.7	7		DLBSS
1861-40-1	Benfluralin	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
314-40-9	Bromacil	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
2104-96-3	Bromophos	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	62	7		DLBSS
4824-78-6	Bromophos-ethyl	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
2008-41-5	Butylate	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	620	7		DLBSS
133-06-2	Captan	ND		ND		µg/g	--	0/80	0.1 - 0.2	0.2	2100	7		DLBSS
786-19-6	Carbophenothion	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	--	--		ND
103-17-3	Chlorbenside	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
80-33-1	Chlorfenson(ovex)	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
470-90-6	Chlorfenvinphos(e/z)	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	8.6	7		DLBSS
24934-91-6	Chlormephos	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
1897-45-6	Chlorothalonil (Daconil)	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	1600	7		DLBSS
101-21-3	Chlorpropham	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	2400	7		DLBSS
2921-88-2	Chlorpyrifos	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	36	7		DLBSS
5598-13-0	Chlorpyriphos-methyl	ND		ND		µg/g	--	0/80	0.03 - 0.06	0.06	122	7		DLBSS
21923-23-9	Chlorthiophos	ND		ND		µg/g	--	0/80	0.03 - 0.06	0.06	9.8	7		DLBSS
21725-46-2	Cyanazine (Bladex)	ND		ND		µg/g	--	0/80	0.03 - 0.06	0.06	5.8	7		DLBSS
2636-26-2	Cyanophos	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
1861-32-1	Dacthal	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	122	7		DLBSS
319-86-8	d-BHC	ND		ND		µg/g	--	0/74	0.01 - 0.02	0.02	2.7	7		DLBSS
8065-48-3	Demeton	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	0.48	7		DLBSS
6190-65-4	Desethyl-atrazine	ND		ND		µg/g	--	0/80	0.03 - 0.06	0.06	--	--		ND
1014-69-3	Desmetryn	ND		ND		µg/g	--	0/80	0.03 - 0.06	0.06	--	--		ND
2303-16-4	Diallate(e/z)	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	80	7		DLBSS
333-41-5	Diazinon	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	8.6	7		DLBSS
1194-65-6	Dichlobenil	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
97-17-6	Dichlofenthion	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND

TABLE F.1

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SOIL
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6, 7)	COPC Flag	Rationale for Contaminant Deletion or Selection (8)
	Pesticides (cont.'d)													
1085-98-9	Dichlofluanid	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
99-30-9	Dichloran	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
--	Dichlorvos + Naled	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
115-32-2	Dicofol	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
141-66-2	Dicrotophos	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
60-57-1	Dieldrin	0.02		4.5		µg/g	SS2 (06/26/04)	15/80	0.02 - 0.04	4.5	0.94	6	X	ASS
60-51-5	Dimethoate	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	2.4	7		DLBSS
78-34-2	Dioxathion	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
122-39-4	Diphenylamine	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	300	7		DLBSS
298-04-4	Disulfoton (Di-Syston)	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	0.48	7		DLBSS
959-98-8	Endosulfan I	ND		ND		µg/g	--	0/80	0.1 - 0.2	0.2	38	6, 9		DLBSS
33213-65-9	Endosulfan II	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	38	6, 9		DLBSS
1031-07-8	Endosulfan Sulfate	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	38	6, 9		DLBSS
72-20-8	Endrin	ND		ND		µg/g	--	0/80	0.1 - 0.2	0.2	4.7	6, 11		DLBSS
7421-93-4	Endrin Aldehyde	ND		ND		µg/g	--	0/74	0.04 - 0.08	0.08	4.7	6, 11		DLBSS
53494-70-5	Endrin ketone	ND		ND		µg/g	--	0/74	0.04 - 0.08	0.08	4.7	6, 11		DLBSS
2104-64-5	EPN	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
759-94-4	Eptam	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
55283-68-6	Ethalfluralin	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
563-12-2	Ethion	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	6.2	7		DLBSS
122-14-5	Fenitrothion	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
115-90-2	Fensulfothion	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
55-38-9	Fenthion	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
133-07-3	Folpet	ND		ND		µg/g	--	0/80	0.1 - 0.2	0.2	1400	7		DLBSS
944-22-9	Fonofos	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	24	7		DLBSS
5566-34-7	g-Chlordane	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	5.9	6, 9		DLBSS
76-44-8	Heptachlor	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	1.5	6		DLBSS
1024-57-3	Heptachlor epoxide	ND		ND		µg/g	--	0/74	0.01 - 0.02	0.02	1.1	6		DLBSS
118-74-1	Hexachlorobenzene	ND		ND		µg/g	--	0/80	0.03 - 0.06	0.06	2.9	6		DLBSS
51235-04-2	Hexazinone	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	400	7		DLBSS

TABLE F.1

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SOIL
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6, 7)	COPC Flag	Rationale for Contaminant Deletion or Selection (8)
	Pesticides (cont.'d)													
18181-70-9	Iodofenphos	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	--	--		ND
36734-19-7	Iprodione	ND		ND		µg/g	--	0/74	0.05 - 0.1	0.1	480	7		DLBSS
25311-71-1	Isofenphos	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
58-89-9	Lindane (BHC), gamma-	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	0.25	6		DLBSS
1634-78-2	Malaoxon	ND		ND		µg/g	--	0/80	0.1 - 0.2	0.2	--	--		ND
121-75-5	Malathion	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	240	7		DLBSS
57837-19-1	Metalaxyl	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	740	7		DLBSS
10265-92-6	Methamidophos	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	0.62	7		DLBSS
950-37-8	Methidathion	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	12.2	7		DLBSS
51218-45-2	Metolachlor	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	1840	7		DLBSS
21087-64-9	Metribuzin (Sencor)	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	300	7		DLBSS
7786-34-7	Mevinphos (Phosdrin)	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
2385-85-5	Mirex	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	0.27	7		DLBSS
1836-75-5	Nitrofen	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
1113-02-6	Omethoate	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
56-38-2	Parathion	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	74	7		DLBSS
298-00-0	Parathion methyl	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	3	7		DLBSS
82-68-8	Pentachloronitrobenzene	ND		ND		µg/g	--	0/74	0.05 - 0.1	0.1	19	7		DLBSS
52645-53-1	Permethrin	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	620	7		DLBSS
298-02-2	Phorate (Thimet)	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	2.4	7		DLBSS
2310-17-0	Phosalone	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
732-11-6	Phosmet	ND		ND		µg/g	--	0/80	0.03 - 0.06	0.06	240	7		DLBSS
13171-21-6	Phosphamidon	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
23103-98-2	Pirimicarb	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
23505-41-1	Pirimiphos-ethyl	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
29232-93-7	Pirimiphos-methyl	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	122	7		DLBSS
32809-16-8	Procymidone	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
41198-08-7	Profenophos	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
26399-36-0	Profluralin	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND

TABLE F.1

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SOIL
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6, 7)	COPC Flag	Rationale for Contaminant Deletion or Selection (8)
	Pesticides (cont.'d)													
7287-19-6	Prometryn	ND		ND		µg/g	--	0/80	0.03 - 0.06	0.06	48	7		DLBSS
23950-58-5	Pronamide	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
139-40-2	Propazine	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	240	7		DLBSS
60207-90-1	Propiconazole	ND		ND		µg/g	--	0/74	0.02 - 0.04	0.04	158	7		DLBSS
13457-18-6	Pyrazophos	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
13593-03-8	Quinalophos	ND		ND		µg/g	--	0/80	0.03 - 0.06	0.06	6.2	7		DLBSS
299-84-3	Ronnel	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	620	7		DLBSS
122-34-9	Simazine	ND		ND		µg/g	--	0/80	0.01 - 0.02	0.02	40	7		DLBSS
22248-79-9	Stirophos	ND		ND		µg/g	--	0/74	0.02 - 0.04	0.04	200	7		DLBSS
3689-24-5	Sulfotepp	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
117-18-0	Tecnazene	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
13071-79-9	Terbufos	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	0.3	7		DLBSS
5915-41-3	Terbuthylazine	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
886-50-0	Terbutryne	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	12.2	7		DLBSS
116-29-0	Tetradifon	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	--	--		ND
731-27-1	Tolylfluanid	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND
43121-43-3	Triadimefon	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	--	--		ND

TABLE F.1

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SOIL
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6, 7)	COPC Flag	Rationale for Contaminant Deletion or Selection (8)
	Pesticides (cont.'d)													
2303-17-5	Triallate	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	158	7		DLBSS
79-07-2	Trifluralin	ND		ND		µg/g	--	0/80	0.05 - 0.1	0.1	630	7		DLBSS
50471-44-8	Vinclozolin	ND		ND		µg/g	--	0/80	0.02 - 0.04	0.04	300	7		DLBSS

Notes:

-- = Not Available

(1) Minimum/maximum detected concentration.

(2) Based on data collected from June 2004 and March 2009.

(3) Based on data collected from sample locations: SS-1, SS-2, SS-3, SS-4, SS-5, SS-6, SS-7, SS-8, SS-9, SS-10, SS-11, SS-12, SS-13, SS-14, SS-15, SS-16, SS-17, SS-18, SS-19, SS-20, SS-21, SS-22, SS-23, SS-24, SS-25, SS-26, SS-27, SS-28, SS-29, SS-30, SS-31, SS-32, SS-33, SS-34, TP-1A, TP-1B, TP-2A, TP-2B, TP-3A, TP-3B, TP-4A, TP-4B, TP-5A, TP-5B, TP-6A, TP-6B, TP-7A, TP-7B, TP-8A, TP-8B, TP-9A, TP-9B, TP-10A, TP-10B, TP-11A, TP-11B, TP-12A, TP-12B, TP-13A, TP-13B, TP-14A, TP-14B, TP-15A, TP-15B, TP-16A, TP-16B, TP-17A, TP-17B, TP-18A, TP-18B, TP-19A, TP-19B, TP-20A, TP-20B, TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, EX1, EX2, SS1, SS2, SS3, SS4, SS5, SS6.

(4) Atlantic Risk Based Corrective Action (RBCA) User Guidance for Petroleum Impacted Sites in Atlantic Canada, Version 2.0, Tier I Risk Based Screening Levels (RBSLs) for Soil: Residential, Potable Groundwater, Coarse-Grained Soil.

(5) Canadian Environmental Quality Guidelines: Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Update 7.1, December 2007) - Residential Land Use, Human Health Guidelines.

(6) MOE Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009.
Appendix A2, Soil Components for Table 3 - Full Depth , Potable Water Scenario, Coarse Textured Soils, Residential/Parkland Land Use - Lower of S1 risk (soil contact), S-GW1 (soil leaching), S-IA (indoor air), Indoor Air Odour, and Outdoor Air, where available.
The MOE screening criterion are based on a 10^{-6} risk level for carcinogens and a hazard index of 0.2 for non-carcinogens. To be consistent with the target risk level of 10^{-5}, the MOE criteria for carcinogens based on a risk of 10^{-6} were multiplied by a factor of 10.

(7) Due to lack of screening criterion available, direct contact residential soil screening level taken from Regional Screening Levels (RSLs) table, November 2010.
Note, soil leaching to groundwater pathway for pesticides in soil is considered to be incomplete based on groundwater pesticide data results.
The RSLs criteria are based on a 10^{-6} risk level for carcinogens and a hazard index of 1 for non-carcinogens. To be consistent with the
target risk and hazard levels of 10^{-5} and 0.2, the RSLs criteria for carcinogens were multiplied by 10 and for non-carcinogens were divided by a factor of 5.

(8) Rationale Codes
Selection Reason : Maximum Detected Above Screening Standard (ASS)
Deletion Reason : Maximum Detection Limit Below Screening Standard (DLBSS)
No screening criteria available, but analyte was only analyzed as it was included in laboratory's suite of analyses and was Not Detected and therefore not present (ND)

(9) Guideline for chlordane.

(10) Guideline for endosulfan

(11) Guideline for endrin.

TABLE F.2

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides													
789-02-6	2,4'-DDD	ND		ND		µg/L	--	0/15	0.01	0.01	--	--		ND
3424-82-6	2,4'-DDE	ND		ND		µg/L	--	0/15	0.01	0.01	--	--		ND
--	2,4'-DDT + 4,4'-DDD	ND		ND		µg/L	--	0/15	0.01	0.01	--	--		ND
72-55-9	4,4'-DDE	ND		ND		µg/L	--	0/15	0.01	0.01	100	5		DLBSS
50-29-3	4,4'-DDT	ND		ND		µg/L	--	0/15	0.02	0.02	100	5		DLBSS
2132-70-9	4,4'-methoxychlor	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
319-84-6	a-BHC	ND		ND		µg/L	--	0/15	0.1	0.1	0.11	6		DLBSS
5103-71-9	a-Chlordane	ND		ND		µg/L	--	0/15	0.06	0.06	4.2	5, 9		DLBSS
15792-50-8	Alachlor	ND		ND		µg/L	--	0/15	0.5	0.5	12	6		DLBSS
309-00-2	Aldrin	ND		ND		µg/L	--	0/15	0.02	0.02	0.7	4, 8		DLBSS
3244-90-4	Aspon	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
1912-24-9	Atrazine	ND		ND		µg/L	--	0/15	0.2	0.2	5	4		DLBSS
86-50-0	Azinophos methyl (Guthion)	ND		ND		µg/L	--	0/15	1	1	20	4		DLBSS
2642-71-9	Azinphos ethyl	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
319-85-7	b-BHC	ND		ND		µg/L	--	0/15	0.1	0.1	0.37	6		DLBSS
1861-40-1	Benfluralin	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
314-40-9	Bromacil	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
2104-96-3	Bromophos	ND		ND		µg/L	--	0/15	0.1	0.1	36	6		DLBSS
4824-78-6	Bromophos-ethyl	ND		ND		µg/L	--	0/15	0.3	0.3	--	--		ND
2008-41-5	Butylate	ND		ND		µg/L	--	0/15	0.5	0.5	360	6		DLBSS
133-06-2	Captan	ND		ND		µg/L	--	0/15	1	1	290	6		DLBSS
786-19-6	Carbophenothion	ND		ND		µg/L	--	0/15	0.3	0.3	--	--		ND
103-17-3	Chlorbenside	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
80-33-1	Chlorfenson(ovex)	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
470-90-6	Chlorfenvinphos(e/z)	ND		ND		µg/L	--	0/15	0.1	0.1	5.2	6		DLBSS
24934-91-6	Chlormephos	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
1897-45-6	Chlorothalonil (Daconil)	ND		ND		µg/L	--	0/15	1	1	220	6		DLBSS
101-21-3	Chlorpropham	ND		ND		µg/L	--	0/15	0.2	0.2	1460	6		DLBSS

TABLE F.2

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
2921-88-2	Chlorpyrifos	ND		ND		µg/L	--	0/15	0.01	0.01	90	4		DLBSS
5598-13-0	Chlorpyriphos-methyl	ND		ND		µg/L	--	0/15	0.1	0.1	74	6		DLBSS
21923-23-9	Chlorthiophos	ND		ND		µg/L	--	0/15	0.3	0.3	5.8	6		DLBSS
21725-46-2	Cyanazine (Bladex)	ND		ND		µg/L	--	0/15	0.5	0.5	10	4		DLBSS
2636-26-2	Cyanophos	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
1861-32-1	Dacthal	ND		ND		µg/L	--	0/15	0.1	0.1	74	6		DLBSS
319-86-8	d-BHC	ND		ND		µg/L	--	0/15	0.1	0.1	0.37	6		DLBSS
8065-48-3	Demeton	ND		ND		µg/L	--	0/15	1	1	0.3	6		NCOPC
6190-65-4	Desethyl-atrazine	ND		ND		µg/L	--	0/15	0.3	0.3	--	--		ND
1014-69-3	Desmetryn	ND		ND		µg/L	--	0/15	0.3	0.3	--	--		ND
2303-16-4	Diallate(e/z)	ND		ND		µg/L	--	0/15	0.5	0.5	11	6		DLBSS
333-41-5	Diazinon	ND		ND		µg/L	--	0/15	0.02	0.02	20	4		DLBSS
1194-65-6	Dichlobenil	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
97-17-6	Dichlofenthion	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
1085-98-9	Dichlofluanid	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
99-30-9	Dichloran	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
--	Dichlorvos + Naled	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
115-32-2	Dicofol	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
141-66-2	Dicrotophos	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
60-57-1	Dieldrin	ND		ND		µg/L	--	0/15	0.03	0.03	0.7	4, 8		DLBSS
60-51-5	Dimethoate	ND		ND		µg/L	--	0/15	0.5	0.5	20	4		DLBSS
78-34-2	Dioxathion	ND		ND		µg/L	--	0/15	1	1	--	--		ND
122-39-4	Diphenylamine	0.1		0.1		µg/L	MW-11 (03/27/09)	1/15	0.1	0.1	182	6		BSS; DLBSS
298-04-4	Disulfoton (Di-Syston)	ND		ND		µg/L	--	0/15	1	1	0.3	6		NCOPC
959-98-8	Endosulfan I	ND		ND		µg/L	--	0/15	0.2	0.2	5.9	5, 10		DLBSS
33213-65-9	Endosulfan II	ND		ND		µg/L	--	0/15	0.2	0.2	5.9	5, 10		DLBSS
1031-07-8	Endosulfan Sulfate	ND		ND		µg/L	--	0/15	0.2	0.2	5.9	5, 10		DLBSS
72-20-8	Endrin	ND		ND		µg/L	--	0/15	0.2	0.2	2	5, 11		DLBSS
7421-93-4	Endrin Aldehyde	ND		ND		µg/L	--	0/15	0.5	0.5	2	5, 11		DLBSS
53494-70-5	Endrin ketone	ND		ND		µg/L	--	0/15	0.5	0.5	2	5, 11		DLBSS

TABLE F.2

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
2104-64-5	EPN	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
759-94-4	Eptam	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
55283-68-6	Ethalfluralin	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
563-12-2	Ethion	ND		ND		µg/L	--	0/15	0.2	0.2	3.6	6		DLBSS
122-14-5	Fenitrothion	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
115-90-2	Fensulfothion	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
55-38-9	Fenthion	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
133-07-3	Folpet	ND		ND		µg/L	--	0/15	1	1	3.8	6		DLBSS
944-22-9	Fonofos	ND		ND		µg/L	--	0/15	0.1	0.1	14.6	6		DLBSS
5566-34-7	g-Chlordane	ND		ND		µg/L	--	0/15	0.06	0.06	4.2	5, 9		DLBSS
76-44-8	Heptachlor	ND		ND		µg/L	--	0/15	0.1	0.1	15	5		DLBSS
1024-57-3	Heptachlor epoxide	ND		ND		µg/L	--	0/15	0.1	0.1	15	5		DLBSS
118-74-1	Hexachlorobenzene	ND		ND		µg/L	--	0/15	0.2	0.2	10	5		DLBSS
51235-04-2	Hexazinone	ND		ND		µg/L	--	0/15	0.1	0.1	240	6		DLBSS
18181-70-9	Iodofenphos	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
36734-19-7	Iprodione	ND		ND		µg/L	--	0/15	1	1	300	6		DLBSS
25311-71-1	Isofenphos	ND		ND		µg/L	--	0/15	0.3	0.3	--	--		ND
58-89-9	Lindane (BHC), gamma-	ND		ND		µg/L	--	0/15	0.1	0.1	4	5		DLBSS
1634-78-2	Malaoxon	ND		ND		µg/L	--	0/15	1	1	--	--		ND
121-75-5	Malathion	ND		ND		µg/L	--	0/15	0.5	0.5	190	4		DLBSS
57837-19-1	Metalaxyl	ND		ND		µg/L	--	0/15	0.3	0.3	440	6		DLBSS
10265-92-6	Methamidophos	ND		ND		µg/L	--	0/15	0.3	0.3	0.36	6		DLBSS
51218-45-2	Metolachlor	ND		ND		µg/L	--	0/15	0.2	0.2	50	4		DLBSS
21087-64-9	Metribuzin (Sencor)	ND		ND		µg/L	--	0/15	0.3	0.3	80	4		DLBSS
7786-34-7	Mevinphos (Phosdrin)	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
2385-85-5	Mirex	ND		ND		µg/L	--	0/15	0.3	0.3	0.037	6		NCOPC
1836-75-5	Nitrofen	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
1113-02-6	Omethoate	ND		ND		µg/L	--	0/15	1	1	--	--		ND

TABLE F.2

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
56-38-2	Parathion	ND		ND		µg/L	--	0/15	0.5	0.5	50	4		DLBSS
298-00-0	Parathion methyl	ND		ND		µg/L	--	0/15	0.5	0.5	1.82	6		DLBSS
82-68-8	Pentachloronitrobenzene	ND		ND		µg/L	--	0/15	0.5	0.5	2.6	6		DLBSS
52645-53-1	Permethrin	ND		ND		µg/L	--	0/15	0.5	0.5	360	6		DLBSS
298-02-2	Phorate (Thimet)	ND		ND		µg/L	--	0/15	0.5	0.5	1.46	6		DLBSS
2310-17-0	Phosalone	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
732-11-6	Phosmet	ND		ND		µg/L	--	0/15	0.2	0.2	146	6		DLBSS
13171-21-6	Phosphamidon	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
23103-98-2	Pirimicarb	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
23505-41-1	Pirimiphos-ethyl	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
29232-93-7	Pirimiphos-methyl	ND		ND		µg/L	--	0/15	0.2	0.2	74	6		DLBSS
32809-16-8	Procymidone	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
41198-08-7	Profenophos	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
26399-36-0	Profluralin	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
7287-19-6	Prometryn	ND		ND		µg/L	--	0/15	0.2	0.2	30	6		DLBSS
23950-58-5	Pronamide	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND
139-40-2	Propazine	ND		ND		µg/L	--	0/15	0.1	0.1	146	6		DLBSS
60207-90-1	Propiconazole	ND		ND		µg/L	--	0/15	0.5	0.5	94	6		DLBSS
13457-18-6	Pyrazophos	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
13593-03-8	Quinalophos	ND		ND		µg/L	--	0/15	0.3	0.3	3.6	6		DLBSS
299-84-3	Ronnel	ND		ND		µg/L	--	0/15	0.1	0.1	360	6		DLBSS
122-34-9	Simazine	ND		ND		µg/L	--	0/15	0.5	0.5	10	4		DLBSS
22248-79-9	Stirophos	ND		ND		µg/L	--	0/15	0.2	0.2	28	6		DLBSS
3689-24-5	Sulfotepp	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
117-18-0	Tecnazene	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
13071-79-9	Terbufos	ND		ND		µg/L	--	0/15	0.3	0.3	1	4		DLBSS
5915-41-3	Terbuthylazine	ND		ND		µg/L	--	0/15	0.1	0.1	--	--		ND
886-50-0	Terbutryne	ND		ND		µg/L	--	0/15	0.2	0.2	7.4	6		DLBSS
116-29-0	Tetradifon	ND		ND		µg/L	--	0/15	0.2	0.2	--	--		ND

TABLE F.2

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN GROUNDWATER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
731-27-1	Tolylfluanid	ND		ND		µg/L	--	0/15	0.5	0.5	--	--		ND
43121-43-3	Triadimefon	ND		ND		µg/L	--	0/15	0.3	0.3	--	--		ND
2303-17-5	Triallate	ND		ND		µg/L	--	0/15	0.3	0.3	94	6		DLBSS
79-07-2	Trifluralin	ND		ND		µg/L	--	0/15	0.2	0.2	87	4		DLBSS
50471-44-8	Vinclozolin	ND		ND		µg/L	--	0/15	0.5	0.5	182	6		DLBSS

Notes:

-- = Not Available

(1) Minimum/maximum detected concentration.

(2) Based on data collected from March 2009.

(3) Based on data collected from sampling locations: MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-16.

(4) Guidelines for Canadian Drinking Water Quality Summary Table, Health Canada, Maximum Acceptable Concentration (MAC) and Interim Maximum Acceptable Concentration (IMAC), December 2010.

(5) MOE Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009.
Appendix A3, Groundwater Components for Potable Water Scenario, Coarse Textured Soils, Residential Land Use - Lower of GW1, GW1 Odour, Residential GW2, and Residential GW2 Odour, where available.
The MOE screening criterion are based on a 10^{-6} risk level for carcinogens and a hazard index of 0.2 for non-carcinogens. To be consistent with the target risk level of 10^{-5}, the MOE criteria for carcinogens based on a risk of 10^{-6} were multiplied by a factor of 10.

(6) Due to lack of screening criterion available, tap water screening level taken from Regional Screening Levels (RSLs) table, November 2010.
The RSLs criteria are based on a 10^{-6} risk level for carcinogens and a hazard index of 1 for non-carcinogens. To be consistent with the target risk and hazard levels of 10^{-5} and 0.2, the RSLs criteria for carcinogens were multiplied by 10 and for non-carcinogens were divided by a factor of 5.

(7) Rationale Codes Deletion Reason : Maximum Detected Below Screening Standard (BSS)
Maximum Detection Limit Below Screening Standard (DLBSS)
No screening criteria available, but analyte Not Detected and therefore not present (ND)
Not a suspected Contaminant of Potential Concern at the site (analyzed as a part of a suite of analyses) (NCOPC)

(8) Guideline for total aldrin and dieldrin.

(9) Guideline for chlordane.

(10) Guideline for endosulfan

(11) Guideline for endrin.

TABLE F.3

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SEDIMENT
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides													
789-02-6	2,4'-DDD	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	--	--		ND
3424-82-6	2,4'-DDE	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	--	--		ND
789-02-6	2,4'-DDT	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	--	--		ND
72-54-8	4,4'-DDD	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	33	5		DLBSS
72-55-9	4,4'-DDE	0.0016		0.0016		µg/g	SED-20 (03/19/09)	1/27	0.0001 - 0.001	0.0016	23	5		BSS; DLBSS
50-29-3	4,4'-DDT	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	23	5		DLBSS
319-84-6	a-BHC	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	0.77	6		DLBSS
30560-19-1	Acephate	ND		ND		µg/g	--	0/24	0.01	0.01	560	6		DLBSS
5103-71-9	a-chlordane	0.0027		0.0027		µg/g	SED-20 (03/19/09)	1/27	0.0001 - 0.001	0.0027	5.9	5, 8		BSS; DLBSS
15792-50-8	Alachlor	ND		ND		µg/g	--	0/24	0.001	0.001	87	6		DLBSS
309-00-2	Aldrin	0.00055		0.00111		µg/g	SED-20 (03/19/09)	2/27	0.0001 - 0.0005	0.00111	0.56	5		BSS; DLBSS
3244-90-4	Aspon	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
1912-24-9	Atrazine	ND		ND		µg/g	--	0/24	0.001	0.001	21	6		DLBSS
2642-71-9	Azinphos Ethyl	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
319-85-7	b-BHC	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	2.7	6		DLBSS
1861-40-1	Benfluralin	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
314-40-9	Bromacil	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
2104-96-3	Bromophos	ND		ND		µg/g	--	0/24	0.001	0.001	62	6		DLBSS
4824-78-6	Bromophos-ethyl	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
2008-41-5	Butylate	ND		ND		µg/g	--	0/24	0.001	0.001	620	6		DLBSS
133-06-2	Captan	ND		ND		µg/g	--	0/24	0.001 - 0.005	0.005	2100	6		DLBSS
786-19-6	Carbophenothion	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
103-17-3	Chlorbenside	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
80-33-1	Chlorfenson (Ovex)	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
470-90-6	Chlorfenvinphos	ND		ND		µg/g	--	0/24	0.001	0.001	8.6	6		DLBSS
24934-91-6	Chlormephos	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
1897-45-6	Chlorothalonil	ND		ND		µg/g	--	0/24	0.005	0.005	1600	6		DLBSS
101-21-3	Chlorpropham	ND		ND		µg/g	--	0/24	0.001	0.001	2400	6		DLBSS

TABLE F.3

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SEDIMENT
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
2921-88-2	Chlorpyrifos	ND		ND		µg/g	--	0/24	0.001	0.001	36	6		DLBSS
5598-13-0	Chlorpyrifos Methyl	ND		ND		µg/g	--	0/24	0.001	0.001	122	6		DLBSS
21923-23-9	Chlorthiophos	ND		ND		µg/g	--	0/24	0.001	0.001	9.8	6		DLBSS
21725-46-2	Cyanazine	ND		ND		µg/g	--	0/24	0.001	0.001	5.8	6		DLBSS
2636-26-2	Cyanophos	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
1861-32-1	Dacthal	ND		ND		µg/g	--	0/24	0.001	0.001	122	6		DLBSS
319-86-8	d-BHC	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	2.7	6		DLBSS
8065-48-3	Demeton	ND		ND		µg/g	--	0/24	0.005	0.005	0.48	6		DLBSS
6190-65-4	Desethyl Atrazine	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
1014-69-3	Desmetryn	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
2303-16-4	Diallate	ND		ND		µg/g	--	0/24	0.001	0.001	80	6		DLBSS
333-41-5	Diazinon	ND		ND		µg/g	--	0/24	0.001	0.001	8.6	6		DLBSS
1194-65-6	Dichlobenil	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
97-17-6	Dichlofenthion	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
1085-98-9	Dichlofluanid	0.0015		0.0078		µg/g	SED-19 (03/19/09)	3/27	0.001 - 0.005	0.0078	--	--		NTX; NCOPC
99-30-9	Dichloran	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
--	Dichlorvos + Naled	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
115-32-2	Dicofol	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
141-66-2	Dicrotophos	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
60-57-1	Dieldrin	0.00057		0.00057		µg/g	--	1/27	0.0001 - 0.0005	0.00057	0.94	5		BSS; DLBSS
60-51-5	Dimethoate	ND		ND		µg/g	--	0/24	0.005	0.005	2.4	6		DLBSS
78-34-2	Dioxathion	ND		ND		µg/g	--	0/24	0.005	0.005	--	--		ND
122-39-4	Diphenylamine	ND		ND		µg/g	--	0/24	0.001	0.001	300	6		DLBSS
298-04-4	Disulfoton	ND		ND		µg/g	--	0/24	0.005	0.005	0.48	6		DLBSS
959-98-8	Endosulfan I	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	38	5, 9		DLBSS
33213-65-9	Endosulfan II	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	38	5, 9		DLBSS
1031-07-8	Endosulfan Sulfate	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	38	5, 9		DLBSS
72-20-8	Endrin	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	4.7	5, 10		DLBSS
7421-93-4	Endrin Aldehyde	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	4.7	5, 10		DLBSS
53494-70-5	Endrin Ketone	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	4.7	5, 10		DLBSS

TABLE F.3

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SEDIMENT
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
2104-64-5	EPN	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
759-94-4	Eptam	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
55283-68-6	Ethalfluralin	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
563-12-2	Ethion	ND		ND		µg/g	--	0/24	0.001	0.001	6.2	6		DLBSS
122-14-5	Fenitrothion	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
115-90-2	Fensulfothion	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
55-38-9	Fenthion	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
133-07-3	Folpet	ND		ND		µg/g	--	0/24	0.005	0.005	1400	6		DLBSS
944-22-9	Fonofos	ND		ND		µg/g	--	0/24	0.001	0.001	24	6		DLBSS
5566-34-7	g-chlordane	0.0023		0.0023		µg/g	SED-20 (03/19/09)	1/27	0.0001 - 0.001	0.0023	5.9	5, 8		BSS; DLBSS
86-50-0	Guthion	ND		ND		µg/g	--	0/24	0.005	0.005	--	--		ND
76-44-8	Heptachlor	0.0007		0.0067		µg/g	SED-20 (03/19/09)	3/27	0.0001 - 0.001	0.0067	1.5	5		BSS; DLBSS
1024-57-3	Heptachlor epoxide	0.0036		0.0036		µg/g	SED-20 (03/19/09)	1/27	0.0001 - 0.001	0.0036	1.1	5		BSS; DLBSS
118-74-1	Hexachlorobenzene	0.0012		0.0012		µg/g	SED-20 (03/19/09)	1/27	0.0001 - 0.001	0.0012	2.9	5		BSS; DLBSS
51235-04-2	Hexazinone	ND		ND		µg/g	--	0/24	0.001	0.001	400	6		DLBSS
18181-70-9	Iodofenphos	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
36734-19-7	Iprodione	ND		ND		µg/g	--	0/24	0.005	0.005	480	6		DLBSS
25311-71-1	Isofenphos	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
58-89-9	Lindane (gamma - BHC)	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	0.25	5		DLBSS
1634-78-2	Malaoxon	ND		ND		µg/g	--	0/24	0.005	0.005	--	--		ND
121-75-5	Malathion	ND		ND		µg/g	--	0/24	0.005	0.005	240	6		DLBSS
57837-19-1	Metalaxyl	ND		ND		µg/g	--	0/24	0.001	0.001	740	6		DLBSS
10265-92-6	Methamidophos	ND		ND		µg/g	--	0/24	0.001	0.001	0.62	6		DLBSS
950-37-8	Methidathion	ND		ND		µg/g	--	0/24	0.001	0.001	12.2	6		DLBSS
72-43-5	Methoxychlor	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	0.38	5		DLBSS
51218-45-2	Metolachlor	ND		ND		µg/g	--	0/24	0.001	0.001	1840	6		DLBSS
21087-64-9	Metribuzin	ND		ND		µg/g	--	0/24	0.001	0.001	300	6		DLBSS
7786-34-7	Mevinphos	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
2385-85-5	Mirex	ND		ND		µg/g	--	0/27	0.0001 - 0.001	0.001	0.27	6		DLBSS
1836-75-5	Nitrofen	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
1113-02-6	Omethoate	ND		ND		µg/g	--	0/24	0.005	0.005	--	--		ND

TABLE F.3

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SEDIMENT
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
56-38-2	Parathion	ND		ND		µg/g	--	0/24	0.001	0.001	74	6		DLBSS
298-00-0	Parathion Methyl	ND		ND		µg/g	--	0/24	0.001	0.001	3	6		DLBSS
82-68-8	Pentachloronitrobenzene	0.0014		0.0014		µg/g	SED-20 (03/19/09)	1/27	0.001 - 0.005	0.005	19	6		BSS; DLBSS
52645-53-1	Permethrin	ND		ND		µg/g	--	0/24	0.001	0.001	620	6		DLBSS
298-02-2	Phorate	ND		ND		µg/g	--	0/24	0.001 - 0.005	0.005	2.4	6		DLBSS
2310-17-0	Phosalone	ND		ND		µg/g	--	0/24	0.001 - 0.005	0.005	--	--		ND
732-11-6	Phosmet	ND		ND		µg/g	--	0/24	0.001	0.001	240	6		DLBSS
13171-21-6	Phosphamidon	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
23103-98-2	Pirimicarb	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
23505-41-1	Pirimiphos-ethyl	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
29232-93-7	Pirimiphos-methyl	ND		ND		µg/g	--	0/24	0.001	0.001	122	6		DLBSS
32809-16-8	Procymidone	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
41198-08-7	Profenophos	0.0018		0.0018		µg/g	SED-19 (03/19/09)	1/27	0.001 - 0.005	0.005	--	--		NTX; NCOPC
26399-36-0	Profluralin	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
7287-19-6	Prometryn	ND		ND		µg/g	--	0/24	0.001	0.001	48	6		DLBSS
23950-58-5	Pronamide	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
139-40-2	Propazine	0.0023		0.0034		µg/g	SED-19 (03/19/09)	2/27	0.001 - 0.005	0.005	240	6		BSS; DLBSS
60207-90-1	Propiconazole	ND		ND		µg/g	--	0/24	0.001	0.001	158	6		DLBSS
13457-18-6	Pyrazophos	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
13593-03-8	Quinalphos	ND		ND		µg/g	--	0/24	0.001	0.001	6.2	6		DLBSS
299-84-3	Ronnel	ND		ND		µg/g	--	0/24	0.001	0.001	620	6		DLBSS
122-34-9	Simazine	ND		ND		µg/g	--	0/24	0.001	0.001	40	6		DLBSS
22248-79-9	Stirophos	ND		ND		µg/g	--	0/24	0.001	0.001	200	6		DLBSS
3689-24-5	Sulfotepp	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
117-18-0	Tecnazene	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
13071-79-9	Terbufos	ND		ND		µg/g	--	0/24	0.001	0.001	0.3	6		DLBSS
5915-41-3	Terbuthylazine	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
886-50-0	Terbutryne	ND		ND		µg/g	--	0/24	0.001	0.001	12.2	6		DLBSS
116-29-0	Tetradifon	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND

TABLE F.3

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SEDIMENT
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

CAS Number	*Chemical*	*Minimum Concentration* (1,2,3)	*Minimum Qualifier*	*Maximum Concentration* (1,2,3)	*Maximum Qualifier*	*Units*	*Location of Maximum Concentration*	*Detection Frequency (2,3)*	*Range of Detection Limits (2,3)*	*Concentration Used for Screening (2,3)*	*Final Screening Criteria*	*Final Screening Criteria Source (4, 5, 6)*	*COPC Flag*	*Rationale for Contaminant Deletion or Selection* (7)
	Pesticides (cont.'d)													
731-27-1	Tolyfluanid	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
43121-43-3	Triadimefon	ND		ND		µg/g	--	0/24	0.001	0.001	--	--		ND
2303-17-5	Triallate	ND		ND		µg/g	--	0/24	0.001	0.001	158	6		DLBSS
79-07-2	Trifluralin	ND		ND		µg/g	--	0/24	0.001	0.001	630	6		DLBSS
50471-44-8	Vinclozolin	ND		ND		µg/g	--	0/24	0.001	0.001	300	6		DLBSS

Notes:

-- = Not Available

(1) Minimum/maximum detected concentration.

(2) Based on data collected from March 2009 and November 2010.

(3) Based on data collected from sampling locations: SED-1, SED-2, SED-3, SED-4, SED-5, SED-6, SED-7, SED-8, SED-9, SED-10, SED-11, SED-12, SED-13, SED-14, SED-15, SED-16, SED-17, SED-18, SED-19, SED-20, SED-21, SED-22, SED-23, SED-24.

(4) Canadian Environmental Quality Guidelines: Chapter 7: Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health (Update 7.1, December 2007) - Residential Land Use, Human Health Guidelines.

(5) MOE Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009.
Appendix A2, Soil Components for Table 3 - Full Depth , Potable Water Scenario, Coarse Textured Soils, Residential/Parkland Land Use - Lower of S1 risk (soil contact), S-GW1 (soil leaching), S-IA (indoor air), Indoor Air Odour, and Outdoor Air, where available. The MOE screening criterion are based on a 10^{-6} risk level for carcinogens and a hazard index of 0.2 for non-carcinogens. To be consistent with the target risk level of 10^{-5}, the MOE criteria for carcinogens based on a risk of 10^{-6} were multiplied by a factor of 10.

(6) Due to lack of screening criterion available, residential soil screening level taken from Regional Screening Levels (RSLs) table, November 2010. The RSLs criteria are based on a 10^{-6} risk level for carcinogens and a hazard index of 1 for non-carcinogens. To be consistent with the target risk and hazard levels of 10^{-5} and 0.2, the RSLs criteria for carcinogens were multiplied by 10 and for non-carcinogens were divided by a factor of 5.

(7) Rationale Codes

Selection Reason :
- Maximum detected above Screening Criterion (ASC)
- Maximum Detection Limit above Screening Criterion (DLASC)
- Analyte Detected and no screening criteria available (AD)

Deletion Reason :
- Maximum detected below Screening Criterion (BSC)
- Maximum Detection Limit below Screening Criterion (DLBSC)
- No screening criteria available, but analyte Not Detected and therefore not present (ND)
- No Toxicity Data available (NTX)
- Not a suspected Contaminant of Potential Concern at the site (analyzed as a part of a suite of analyses) (NCOPC)

(8) Guideline for chlordane.

(9) Guideline for endosulfan

(10) Guideline for endrin.

TABLE F.4

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SURFACE WATER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides													
789-02-6	2,4'-DDD	ND		ND		µg/L	--	0/24	0.01	0.01	--	--		ND
3424-82-6	2,4'-DDE	ND		ND		µg/L	--	0/24	0.01	0.01	--	--		ND
--	2,4'-DDT + 4,4'-DDD	ND		ND		µg/L	--	0/25	0.01 - 0.2	0.2	--	--		ND
72-55-9	4,4'-DDE	ND		ND		µg/L	--	0/25	0.01 - 0.1	0.1	100	5		DLBSS
50-29-3	4,4'-DDT	ND		ND		µg/L	--	0/24	0.1 - 0.6	0.6	100	5		DLBSS
2132-70-9	4,4'-methoxychlor	ND		ND		µg/L	--	0/25	0.1 - 0.6	0.6	--	--		ND
319-84-6	a-BHC	ND		ND		µg/L	--	0/25	0.1 - 0.3	0.3	0.11	6		NCOPC
5103-71-9	a-Chlordane	ND		ND		µg/L	--	0/25	0.06 - 0.5	0.5	4.2	5, 9		DLBSS
15792-50-8	Alachlor	ND		ND		µg/L	--	0/25	0.5	0.5	12	6		DLBSS
309-00-2	Aldrin	ND		ND		µg/L	--	0/25	0.02 - 0.3	0.3	0.7	4, 8		DLBSS
3244-90-4	Aspon	ND		ND		µg/L	--	0/25	0.2	0.2	--	--		ND
1912-24-9	Atrazine	ND		ND		µg/L	--	0/25	0.2	0.2	5	4		DLBSS
86-50-0	Azinophos methyl (Guthion)	ND		ND		µg/L	--	0/25	1	1	20	4		DLBSS
2642-71-9	Azinphos ethyl	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
319-85-7	b-BHC	ND		ND		µg/L	--	0/25	0.1 - 0.3	0.3	0.37	6		DLBSS
1861-40-1	Benfluralin	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
314-40-9	Bromacil	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
2104-96-3	Bromophos	ND		ND		µg/L	--	0/25	0.1	0.1	36	6		DLBSS
4824-78-6	Bromophos-ethyl	ND		ND		µg/L	--	0/25	0.3	0.3	--	--		ND
2008-41-5	Butylate	ND		ND		µg/L	--	0/25	0.5	0.5	360	6		DLBSS
133-06-2	Captan	ND		ND		µg/L	--	0/25	1 - 3	3	290	6		DLBSS
786-19-6	Carbophenothion	ND		ND		µg/L	--	0/25	0.3	0.3	--	--		ND
103-17-3	Chlorbenside	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
80-33-1	Chlorfenson(ovex)	ND		ND		µg/L	--	0/25	0.2	0.2	--	--		ND
470-90-6	Chlorfenvinphos(e/z)	ND		ND		µg/L	--	0/25	0.1	0.1	5.2	6		DLBSS
24934-91-6	Chlormephos	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
1897-45-6	Chlorothalonil (Daconil)	ND		ND		µg/L	--	0/25	0.2 - 1	1	220	6		DLBSS
101-21-3	Chlorpropham	ND		ND		µg/L	--	0/25	0.2	0.2	1460	6		DLBSS

TABLE F.4

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SURFACE WATER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
2921-88-2	Chlorpyrifos	ND		ND		µg/L	--	0/25	0.01 - 0.2	0.2	90	4		DLBSS
5598-13-0	Chlorpyriphos-methyl	ND		ND		µg/L	--	0/25	0.1	0.1	74	6		DLBSS
21923-23-9	Chlorthiophos	ND		ND		µg/L	--	0/25	0.3	0.3	5.8	6		DLBSS
21725-46-2	Cyanazine (Bladex)	ND		ND		µg/L	--	0/25	0.5	0.5	10	4		DLBSS
2636-26-2	Cyanophos	ND		ND		µg/L	--	0/25	0.2 - 2	2	--	--		ND
1861-32-1	Dacthal	ND		ND		µg/L	--	0/25	0.1	0.1	74	6		DLBSS
319-86-8	d-BHC	ND		ND		µg/L	--	0/24	0.1	0.1	0.37	6		DLBSS
8065-48-3	Demeton	ND		ND		µg/L	--	0/25	1	1	0.3	6		NCOPC
6190-65-4	Desethyl-atrazine	ND		ND		µg/L	--	0/25	0.3	0.3	--	--		ND
1014-69-3	Desmetryn	ND		ND		µg/L	--	0/25	0.3	0.3	--	--		ND
2303-16-4	Diallate(e/z)	ND		ND		µg/L	--	0/25	0.5	0.5	11	6		DLBSS
333-41-5	Diazinon	ND		ND		µg/L	--	0/25	0.02 - 0.3	0.3	20	4		DLBSS
1194-65-6	Dichlobenil	ND		ND		µg/L	--	0/25	0.2 - 0.3	0.3	--	--		ND
97-17-6	Dichlofenthion	ND		ND		µg/L	--	0/25	0.2	0.2	--	--		ND
1085-98-9	Dichlofluanid	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
99-30-9	Dichloran	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
--	Dichlorvos + Naled	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
115-32-2	Dicofol	ND		ND		µg/L	--	0/25	0.2 - 0.4	0.4	--	--		ND
141-66-2	Dicrotophos	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
60-57-1	Dieldrin	ND		ND		µg/L	--	0/25	0.03 - 0.5	0.5	0.7	4, 8		DLBSS
60-51-5	Dimethoate	ND		ND		µg/L	--	0/25	0.5	0.5	20	4		DLBSS
78-34-2	Dioxathion	ND		ND		µg/L	--	0/25	1	1	--	--		ND
122-39-4	Diphenylamine	ND		ND		µg/L	--	0/25	0.1	0.1	182	6		DLBSS
298-04-4	Disulfoton (Di-Syston)	ND		ND		µg/L	--	0/25	1	1	0.3	6		NCOPC
959-98-8	Endosulfan I	ND		ND		µg/L	--	0/25	0.2 - 0.5	0.5	5.9	5, 10		DLBSS
33213-65-9	Endosulfan II	ND		ND		µg/L	--	0/25	0.2 - 0.5	0.5	5.9	5, 10		DLBSS
1031-07-8	Endosulfan Sulfate	ND		ND		µg/L	--	0/25	0.2 - 0.5	0.5	5.9	5, 10		DLBSS
72-20-8	Endrin	ND		ND		µg/L	--	0/25	0.02 - 0.5	0.5	2	5, 11		DLBSS
7421-93-4	Endrin Aldehyde	ND		ND		µg/L	--	0/24	0.5	0.5	2	5, 11		DLBSS
53494-70-5	Endrin ketone	ND		ND		µg/L	--	0/24	0.5 - 0.6	0.6	2	5, 11		DLBSS

TABLE F.4

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SURFACE WATER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
2104-64-5	EPN	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
759-94-4	Eptam	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
55283-68-6	Ethalfluralin	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
563-12-2	Ethion	ND		ND		µg/L	--	0/25	0.2	0.2	3.6	6		DLBSS
122-14-5	Fenitrothion	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
115-90-2	Fensulfothion	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
55-38-9	Fenthion	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
133-07-3	Folpet	ND		ND		µg/L	--	0/25	1 - 3	3	3.8	6		DLBSS
944-22-9	Fonofos	ND		ND		µg/L	--	0/25	0.1	0.1	14.6	6		DLBSS
5566-34-7	g-Chlordane	ND		ND		µg/L	--	0/25	0.06 - 0.5	0.5	4.2	5, 9		DLBSS
76-44-8	Heptachlor	ND		ND		µg/L	--	0/25	0.1 - 0.5	0.5	15	5		DLBSS
1024-57-3	Heptachlor epoxide	ND		ND		µg/L	--	0/24	0.1	0.1	15	5		DLBSS
118-74-1	Hexachlorobenzene	ND		ND		µg/L	--	0/25	0.2	0.2	10	5		DLBSS
51235-04-2	Hexazinone	ND		ND		µg/L	--	0/25	0.1	0.1	240	6		DLBSS
18181-70-9	Iodofenphos	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
36734-19-7	Iprodione	ND		ND		µg/L	--	0/24	1	1	300	6		DLBSS
25311-71-1	Isofenphos	ND		ND		µg/L	--	0/25	0.3	0.3	--	--		ND
58-89-9	Lindane (BHC), gamma-	ND		ND		µg/L	--	0/25	0.1 - 0.5	0.5	4	5		DLBSS
1634-78-2	Malaoxon	ND		ND		µg/L	--	0/25	0.5 - 1	1	--	--		ND
121-75-5	Malathion	ND		ND		µg/L	--	0/25	0.5	0.5	190	4		DLBSS
57837-19-1	Metalaxyl	ND		ND		µg/L	--	0/25	0.3	0.3	440	6		DLBSS
10265-92-6	Methamidophos	ND		ND		µg/L	--	0/25	0.3	0.3	0.36	6		DLBSS
51218-45-2	Metolachlor	ND		ND		µg/L	--	0/25	0.2	0.2	50	4		DLBSS
21087-64-9	Metribuzin (Sencor)	ND		ND		µg/L	--	0/25	0.3	0.3	80	4		DLBSS
7786-34-7	Mevinphos (Phosdrin)	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
2385-85-5	Mirex	ND		ND		µg/L	--	0/25	0.3	0.3	0.037	6		NCOPC
1836-75-5	Nitrofen	ND		ND		µg/L	--	0/25	0.2	0.2	--	--		ND
1113-02-6	Omethoate	ND		ND		µg/L	--	0/25	1	1	--	--		ND

TABLE F.4

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SURFACE WATER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
56-38-2	Parathion	ND		ND		µg/L	--	0/25	0.5	0.5	50	4		DLBSS
298-00-0	Parathion methyl	ND		ND		µg/L	--	0/25	0.5	0.5	1.82	6		DLBSS
82-68-8	Pentachloronitrobenzene	ND		ND		µg/L	--	0/24	0.5	0.5	2.6	6		DLBSS
52645-53-1	Permethrin	ND		ND		µg/L	--	0/25	0.5	0.5	360	6		DLBSS
298-02-2	Phorate (Thimet)	ND		ND		µg/L	--	0/25	0.5	0.5	1.46	6		DLBSS
2310-17-0	Phosalone	ND		ND		µg/L	--	0/25	0.2 - 0.6	0.6	--	--		ND
732-11-6	Phosmet	ND		ND		µg/L	--	0/25	0.2	0.2	146	6		DLBSS
13171-21-6	Phosphamidon	ND		ND		µg/L	--	0/25	0.2	0.2	--	--		ND
23103-98-2	Pirimicarb	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
23505-41-1	Pirimiphos-ethyl	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
29232-93-7	Pirimiphos-methyl	ND		ND		µg/L	--	0/25	0.2	0.2	74	6		DLBSS
32809-16-8	Procymidone	ND		ND		µg/L	--	0/25	0.2	0.2	--	--		ND
41198-08-7	Profenophos	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
26399-36-0	Profluralin	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
7287-19-6	Prometryn	ND		ND		µg/L	--	0/25	0.2	0.2	30	6		DLBSS
23950-58-5	Pronamide	ND		ND		µg/L	--	0/25	0.2	0.2	--	--		ND
139-40-2	Propazine	ND		ND		µg/L	--	0/25	0.1	0.1	146	6		DLBSS
60207-90-1	Propiconazole	ND		ND		µg/L	--	0/24	0.5	0.5	94	6		DLBSS
13457-18-6	Pyrazophos	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
13593-03-8	Quinalophos	ND		ND		µg/L	--	0/25	0.3	0.3	3.6	6		DLBSS
299-84-3	Ronnel	ND		ND		µg/L	--	0/25	0.1	0.1	360	6		DLBSS
122-34-9	Simazine	ND		ND		µg/L	--	0/25	0.5	0.5	10	4		DLBSS
22248-79-9	Stirophos	ND		ND		µg/L	--	0/24	0.2	0.2	28	6		DLBSS
3689-24-5	Sulfotepp	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
117-18-0	Tecnazene	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
13071-79-9	Terbufos	ND		ND		µg/L	--	0/25	0.3	0.3	1	4		DLBSS
5915-41-3	Terbuthylazine	ND		ND		µg/L	--	0/25	0.1	0.1	--	--		ND
886-50-0	Terbutryne	ND		ND		µg/L	--	0/25	0.2	0.2	7.4	6		DLBSS
116-29-0	Tetradifon	ND		ND		µg/L	--	0/25	0.2	0.2	--	--		ND

TABLE F.4

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN SURFACE WATER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source (4, 5, 6)	COPC Flag	Rationale for Contaminant Deletion or Selection (7)
	Pesticides (cont.'d)													
731-27-1	Tolylfluanid	ND		ND		µg/L	--	0/25	0.5	0.5	--	--		ND
43121-43-3	Triadimefon	ND		ND		µg/L	--	0/25	0.3	0.3	--	--		ND
2303-17-5	Triallate	ND		ND		µg/L	--	0/25	0.3	0.3	94	6		DLBSS
79-07-2	Trifluralin	ND		ND		µg/L	--	0/25	0.2	0.2	87	4		DLBSS
50471-44-8	Vinclozolin	ND		ND		µg/L	--	0/25	0.5	0.5	182	6		DLBSS

Notes:

-- = Not Available

(1) Minimum/maximum detected concentration.

(2) Based on data collected from June 2004 and March 2009.

(3) Based on data collected from sampling locations: SW1, SW-1, SW-2, SW-3, SW-4, SW-5, SW-6, SW-7, SW-8, SW-9, SW-10, SW-11, SW-12, SW-13, SW-14, SW-15, SW-16, SW-17, SW-18, SW-19, SW-20, SW-21, SW-22, SW-23, SW-24.

(4) Guidelines for Canadian Drinking Water Quality Summary Table, Health Canada, Maximum Acceptable Concentration (MAC) and Interim Maximum Acceptable Concentration (IMAC), December 2010.

(5) MOE Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December 22, 2009.
Appendix A3, Groundwater Components for Potable Water Scenario, Coarse Textured Soils, Residential Land Use - Lower of GW1, GW1 Odour, Residential GW2, and Residential GW2 Odour, where available.
The MOE screening criterion are based on a 10^{-6} risk level for carcinogens and a hazard index of 0.2 for non-carcinogens. To be consistent with the target risk level of 10^{-5}, the MOE criteria for carcinogens based on a risk of 10^{-6} were multiplied by a factor of 10.

(6) Due to lack of screening criterion available, tap water screening level taken from Regional Screening Levels (RSLs) table, November 2010.
The RSLs criteria are based on a 10^{-6} risk level for carcinogens and a hazard index of 1 for non-carcinogens. To be consistent with the target risk and hazard levels of 10^{-5} and 0.2, the RSLs criteria for carcinogens were multiplied by 10 and for non-carcinogens were divided by a factor of 5.

(7) Rationale Codes — Deletion Reason :
Maximum Detection Limit Below Screening Standard (DLBSS)
No screening criteria available, but analyte Not Detected and therefore not present (ND)
Not a suspected Contaminant of Potential Concern at the Site (analyzed as a part of a suite of analyses) (NCOPC)

(8) Guideline for total aldrin and dieldrin.

(9) Guideline for chlordane.

(10) Guideline for endosulfan

(11) Guideline for endrin.

TABLE F.5

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN FISH
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish

CAS Number	Chemical	Minimum Concentration (1,2,3)	Minimum Qualifier	Maximum Concentration (1,2,3)	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2,3)	Range of Detection Limits (2,3)	Concentration Used for Screening (2,3)	Final Screening Criteria	Final Screening Criteria Source	COPC Flag	Rationale for Contaminant Deletion or Selection (4)
	Pesticides													
789-02-6	2,4′-DDD	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
3424-82-6	2,4′-DDE	0.1		0.1		µg/kg	Oxley's Pond, Fillet #4 (12/08/10)	1/15	0.1	0.1	--	--	X	AD
789-02-6	2,4′-DDT	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
72-54-8	4,4′-DDD	0.33		0.33		µg/kg	Oxley's Pond, Fillet #2 (12/08/10)	1/15	0.1	0.33	--	--	X	AD
72-55-9	4,4′-DDE	0.24		5.75		µg/kg	Oxley's Pond, Fillet #4 (12/08/10)	15/15	--	5.75	--	--	X	AD
50-29-3	4,4′-DDT	0.25		0.89		µg/kg	Oxley's Pond, Fillet #4 (12/08/10)	6/15	0.1	0.89	--	--	X	AD
309-00-2	Aldrin	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
319-84-6	alpha-BHC	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
5103-71-9	alpha-Chlordane	0.17		0.45		µg/kg	Oxley's Pond, Fillet #4 (12/08/10)	3/15	0.1	0.45	--	--	X	AD
319-85-7	beta-BHC	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
319-86-8	delta-BHC	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
60-57-1	Dieldrin	0.11		1.7		µg/kg	Oxley's Pond, Fillet #5 (12/08/10)	14/15	0.1	1.7	--	--	X	AD
959-98-8	Endosulfan I	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
33213-65-9	Endosulfan II	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
1031-07-8	Endosulfan Sulfate	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
72-20-8	Endrin	0.23		0.23		µg/kg	Pond K; Fillet #1 (12/03/10)	1/15	0.1	0.23	--	--	X	AD
7421-93-4	Endrin Aldehyde	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
53494-70-5	Endrin Ketone	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
58-89-9	gamma-BHC (Lindane)	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
5566-34-7	gamma-Chlordane	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
76-44-8	Heptachlor	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
1024-57-3	Heptachlor Epoxide	ND		ND		µg/kg	--	0/15	0.1	0.1	--	--		ND
118-74-1	Hexachlorobenzene	0.1		0.44		µg/kg	Oxley's Pond, Fillet #1 (12/08/10)	8/15	0.1	0.44	--	--	X	AD
72-43-5	Methoxychlor	0.34		0.74		µg/kg	Oxley's Pond, Fillet #4 (12/08/10)	6/15	0.1	0.74	--	--	X	AD
2385-85-5	Mirex	0.1		0.13		µg/kg	Oxley's Pond, Fillet #4 (12/08/10)	2/15	0.1	0.13	--	--	X	AD

TABLE F.5

IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCs) IN FISH
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish

CAS Number	*Chemical*	*Minimum Concentration* (1,2,3)	*Minimum Qualifier*	*Maximum Concentration* (1,2,3)	*Maximum Qualifier*	*Units*	*Location of Maximum Concentration*	*Detection Frequency (2,3)*	*Range of Detection Limits (2,3)*	*Concentration Used for Screening (2,3)*	*Final Screening Criteria*	*Final Screening Criteria Source*	*COPC Flag*	*Rationale for Contaminant Deletion or Selection* (4)
	Pesticides (cont.'d)													
82-68-8	Pentachloronitrobenzene	ND		ND		µg/kg	--	0/15	20	20	--	--		ND
41198-08-7	Profenofos	ND		ND		µg/kg	--	0/15	20	20	--	--		ND
139-40-2	Propazine	ND		ND		µg/kg	--	0/15	20	20	--	--		ND
39765-80-5	Trans-nonachlor	0.11		1.54		µg/kg	Oxley's Pond, Fillet #4 (12/08/10)	8/15	0.1	1.54	--	--	X	AD

Notes:

-- = Not Available

(1) Minimum/maximum detected concentration.

(2) Based on data collected from December 2010.

(3) Based on data collected from sampling locations: Oxley's Pond, Pond J, Pond K.

(4) Rationale Codes Selection Reason : Analyte Detected and no screening criteria available (AD)
Deletion Reason : No screening criteria available, but analyte Not Detected and therefore not present (ND)

TABLE F.6

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN SOIL
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Soil

Chemical of Potential Concern	*Units*	*Arithmetic Mean*	*95% UCL of Normal Data*	*Maximum Detected Concentration*	*EPC Units*	*Reasonable Maximum Exposure*		
						Medium EPC Value	*Medium EPC Statistic*	*Medium EPC Rationale*
Pesticides								
Dieldrin	µg/g	1.64E-01	(1)	4.50E+00	µg/g	2.86E-01	95% UCL-N	W-Test (2) (3)

Notes:

For data sets with non-detects, the Kaplan-Meier method was used (per USEPA 2006).

W-Test: Developed by Shapiro and Wilk for data sets with under 50 samples.
Developed by Shapiro and Francia for data sets with over 50 samples but under 100 samples.

Statistics: Maximum Detected Value (Max); Maximum Detection Limit (MaxDL); 95% UCL of Normal Data (95% UCL-N);
95% UCL of Log-transformed Data (95% UCL-L); 95% UCL of Gamma distributed data (95% UCL-G);
Non-parametric method used to Determine 95% UCL (95% UCL-NP).

(1) Data set is gamma distributed.

(2) Shapiro-Wilk W Test was used for data sets where n>50. Shapiro-Francia W Test was used for data sets where 50<n>100.

(3) Due to the possibility that a residential receptors may spend the majority of their time on an individual cottage lot rather than equally throughout the site, the maximum soil concentration was carried forward as the EPC in hazard and risk calculations

TABLE F.7

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN FISH
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/Future
Medium: Fish
Exposure Medium: Fish

Chemical of Potential Concern	*Units*	*Arithmetic Mean*	*95% UCL of Normal Data*	*Maximum Detected Concentration*	*EPC Units*	*Reasonable Maximum Exposure*		
						Medium EPC Value	*Medium EPC Statistic*	*Medium EPC Rationale*
Pesticides								
2,4′-DDE	µg/kg	5.33E-02	(1)	1.00E-01	µg/kg	1.00E-01	95% UCL-N	W-Test (4)
4,4′-DDD	µg/kg	6.87E-02	(1)	3.30E-01	µg/kg	3.30E-01	95% UCL-N	W-Test (4)
4,4′-DDE	µg/kg	1.19E+00	(1)	5.75E+00	µg/kg	2.96E+00	95% UCL-NP	W-Test (4)
4,4′-DDT	µg/kg	2.29E-01	4.79E-01	8.90E-01	µg/kg	4.79E-01	95% UCL-N	W-Test (4)
alpha-Chlordane	µg/kg	1.09E-01	4.50E-01	4.50E-01	µg/kg	4.50E-01	95% UCL-N	W-Test (4)
Dieldrin	µg/kg	4.09E-01	(1)	1.70E+00	µg/kg	9.74E-01	95% UCL-NP	W-Test (4)
Endrin	µg/kg	6.20E-02	(1)	2.30E-01	µg/kg	2.30E-01	95% UCL-N	W-Test (4)
Hexachlorobenzene	µg/kg	1.13E-01	(1)	4.40E-01	µg/kg	1.81E-01	95% UCL-N	W-Test (4)
Methoxychlor	µg/kg	2.25E-01	4.79E-01	7.40E-01	µg/kg	4.79E-01	95% UCL-N	W-Test (4)
Mirex	µg/kg	5.87E-02	(1)	1.30E-01	µg/kg	1.30E-01	95% UCL-N	W-Test (4)
Trans-nonachlor	µg/kg	3.22E-01	(1)	1.54E+00	µg/kg	5.72E-01	95% UCL-N	W-Test (4)

Notes:

For data sets with non-detects, the Kaplan-Meier method was used (per USEPA 2006).

W-Test: Developed by Shapiro and Wilk for data sets with under 50 samples.

Statistics: Maximum Detected Value (Max); Maximum Detection Limit (MaxDL); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-L); 95% UCL of Gamma distributed data (95% UCL-G); Non-parametric method used to Determine 95% UCL (95% UCL-NP).

(1) Data set is neither normally, gamma or lognormally distributed. A non-parametric UCL is required.

(2) Data set is lognormally distributed.

(3) Data set is gamma distributed.

(4) Shapiro-Wilk W Test was used for data sets where n>50.

TABLE F.8

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL - RESIDENT
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future
Medium: Soil
Exposure Medium: Soil
Receptor Population: Resident
Receptor Age: Toddler (1)

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Soil	mg/kg	(2)	(2)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR - infant	Ingestion Rate of Soil	mg soil/day	20	Health Canada, 2009a	CS x IR x RAF x CF x EF x ED x 1/BW x 1/AT
	IR - toddler	Ingestion Rate of Soil	mg soil/day	80	Health Canada, 2009a	
	IR - child	Ingestion Rate of Soil	mg soil/day	20	Health Canada, 2009a	
	IR - teen	Ingestion Rate of Soil	mg soil/day	20	Health Canada, 2009a	
	IR - adult	Ingestion Rate of Soil	mg soil/day	20	Health Canada, 2009a	
	CF	Conversion Factor	kg/mg	1.00E-06	--	
	EF	Exposure Frequency	days/year	255	Professional Judgment (9)	
	ED - infant	Exposure Duration	years	0.5	Health Canada, 2009a	
	ED - toddler	Exposure Duration	years	4.5	Health Canada, 2009a	
	ED - child	Exposure Duration	years	7	Health Canada, 2009a	
	ED - teen	Exposure Duration	years	8	Health Canada, 2009a	
	ED - adult	Exposure Duration	years	60	Health Canada, 2009a	
	BW - infant	Body Weight	kg	8.2	Health Canada, 2009a	
	BW - toddler	Body Weight	kg	16.5	Health Canada, 2009a	
	BW - child	Body Weight	kg	32.9	Health Canada, 2009a	
	BW - teen	Body Weight	kg	59.7	Health Canada, 2009a	
	BW - adult	Body Weight	kg	70.7	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	29,200	Health Canada, 2009a	
	AT-N	Averaging Time (non-cancer)	days	1,643	Health Canada, 2009a	
	RAFo	Relative Absorption Factor (oral)	%/100	1	Health Canada, 2009a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	(2)	(2)	CDI (mg/kg-day) =
	SA - infant	Skin Surface Area Available for Contact	cm^2/event	1,050	Health Canada, 2009a (3)	CS x CF x SA x AF x RAF x EF x ED x 1/BW x 1/AT
	SA - toddler	Skin Surface Area Available for Contact	cm^2/event	1,720	Health Canada, 2009a (4)	
	SA - child	Skin Surface Area Available for Contact	cm^2/event	2,865	Health Canada, 2009a (5)	
	SA - teen	Skin Surface Area Available for Contact	cm^2/event	4,400	Health Canada, 2009a (6)	
	SA - adult	Skin Surface Area Available for Contact	cm^2/event	5,000	Health Canada, 2009a (7)	
	CF	Conversion Factor	kg/mg	1.00E-06	--	
	EF	Exposure Frequency	days/year	255	Professional Judgment (9)	
	ED - infant	Exposure Duration	years	0.5	Health Canada, 2009a	
	ED - toddler	Exposure Duration	years	4.5	Health Canada, 2009a	
	ED - child	Exposure Duration	years	7	Health Canada, 2009a	
	ED - teen	Exposure Duration	years	8	Health Canada, 2009a	
	ED - adult	Exposure Duration	years	60	Health Canada, 2009a	
	BW - infant	Body Weight	kg	8.2	Health Canada, 2009a	
	BW - toddler	Body Weight	kg	16.5	Health Canada, 2009a	
	BW - child	Body Weight	kg	32.9	Health Canada, 2009a	
	BW - teen	Body Weight	kg	59.7	Health Canada, 2009a	
	BW - adult	Body Weight	kg	70.7	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	29,200	Health Canada, 2009a	
	AT-N	Averaging Time (non-cancer)	days	1,643	Health Canada, 2009a	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.1	Health Canada, 2009a	
	RAFd	Relative Absorption Factor (dermal)	%/100	chemical-specific	Health Canada, 2009a (8)	

TABLE F.8

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL - RESIDENT
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future
Medium: Soil
Exposure Medium: Soil
Receptor Population: Resident
Receptor Age: Toddler (1)

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*Intake Equation/ Model Name*
Inhalation	CS	Chemical Concentration in Soil	mg/kg	(2)	(2)	CDI (mg/m^3) =
	FT	Fraction Time Exposed	unitless	24/24	Professional Judgment (10)	CS x FT x EF x ED x VF x 1/AT
	EF	Exposure Frequency	days/year	255	Professional Judgment (9)	
	ED - infant	Exposure Duration	years	0.5	Health Canada, 2009a	
	ED - toddler	Exposure Duration	years	4.5	Health Canada, 2009a	
	ED - child	Exposure Duration	years	7	Health Canada, 2009a	
	ED - teen	Exposure Duration	years	8	Health Canada, 2009a	
	ED - adult	Exposure Duration	years	60	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	29,200	Health Canada, 2009a	
	AT-N	Averaging Time (non-cancer)	days	1,643	Health Canada, 2009a	
	VF	Volatilization Factor	kg/m^3	chemical-specific	Refer to Table F.10	

Notes:

(1) Carcinogenic risk evaluates infant, toddler, child, teen, and adult over a 80 year lifetime. Non-carcinogenic hazard quotient evaluates toddler exposure that being the most sensitive receptor.

(2) Refer to Table F.6 for soil concentrations.

(3) Skin surface area to include hands (320 cm^2), lower arms (550/2 cm^2) and lower legs (910/2 cm^2).

(4) Skin surface area to include hands (430 cm^2), lower arms (890/2 cm^2) and lower legs (1690/2 cm^2).

(5) Skin surface area to include hands (590 cm^2), lower arms (1480/2 cm^2) and lower legs (3070/2 cm^2).

(6) Skin surface area to include hands (800 cm^2), lower arms (2230/2 cm^2) and lower legs (4970/2 cm^2).

(7) Skin surface area to include hands (890 cm^2), lower arms (2500/2 cm^2) and lower legs (5720/2 cm^2).

(8) Relative Absorption Factor (dermal) for Deildrin is 0.1.

(9) Professional Judgment; for exposed coastal sites snow cover persists for 110 days (Canadian Technical Report, 2003).
This is consistent with Environment Canada (www.climate.weatheroffice.ec.gc.ca) weather data provided for Newfoundland stations.

(10) Professional Judgment; assumes resident spends unlimited amount of time outside.

References:

Health Canada, 2009a: Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), DRAFT Version 2.0, May 2009.

Canadian Technical Report, 2003: Canadian Technical Report of Fisheries and Aquatic Sciences No. 2495, 2003.

TABLE F.9

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL - RECREATIONAL USER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future
Medium: Soil
Exposure Medium: Soil
Receptor Population: Recreational User
Receptor Age: Toddler (1)

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Soil	mg/kg	(2)	(2)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR - infant	Ingestion Rate of Soil	mg soil/day	20	Health Canada, 2009a	CS x IR x RAF x CF x EF x ED x 1/BW x 1/AT
	IR - toddler	Ingestion Rate of Soil	mg soil/day	80	Health Canada, 2009a	
	IR - child	Ingestion Rate of Soil	mg soil/day	20	Health Canada, 2009a	
	IR - teen	Ingestion Rate of Soil	mg soil/day	20	Health Canada, 2009a	
	IR - adult	Ingestion Rate of Soil	mg soil/day	20	Health Canada, 2009a	
	CF	Conversion Factor	kg/mg	1.00E-06	--	
	EF	Exposure Frequency	days/year	70	Health Canada, 2009a (9)	
	ED - infant	Exposure Duration	years	0.5	Health Canada, 2009a	
	ED - toddler	Exposure Duration	years	4.5	Health Canada, 2009a	
	ED - child	Exposure Duration	years	7	Health Canada, 2009a	
	ED - teen	Exposure Duration	years	8	Health Canada, 2009a	
	ED - adult	Exposure Duration	years	60	Health Canada, 2009a	
	BW - infant	Body Weight	kg	8.2	Health Canada, 2009a	
	BW - toddler	Body Weight	kg	16.5	Health Canada, 2009a	
	BW - child	Body Weight	kg	32.9	Health Canada, 2009a	
	BW - teen	Body Weight	kg	59.7	Health Canada, 2009a	
	BW - adult	Body Weight	kg	70.7	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	29,200	Health Canada, 2009a	
	AT-N	Averaging Time (non-cancer)	days	1,643	Health Canada, 2009a	
	RAFo	Relative Absorption Factor (oral)	%/100	1	Health Canada, 2009a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	(2)	(2)	CDI (mg/kg-day) =
	SA - infant	Skin Surface Area Available for Contact	cm^2/event	1,050	Health Canada, 2009a (3)	CS x CF x SA x AF x RAF x EF x ED x 1/BW x 1/AT
	SA - toddler	Skin Surface Area Available for Contact	cm^2/event	1,720	Health Canada, 2009a (4)	
	SA - child	Skin Surface Area Available for Contact	cm^2/event	2,865	Health Canada, 2009a (5)	
	SA - teen	Skin Surface Area Available for Contact	cm^2/event	4,400	Health Canada, 2009a (6)	
	SA - adult	Skin Surface Area Available for Contact	cm^2/event	5,000	Health Canada, 2009a (7)	
	CF	Conversion Factor	kg/mg	1.00E-06	--	
	EF	Exposure Frequency	days/year	70	Health Canada, 2009a (9)	
	ED - infant	Exposure Duration	years	0.5	Health Canada, 2009a	
	ED - toddler	Exposure Duration	years	4.5	Health Canada, 2009a	
	ED - child	Exposure Duration	years	7	Health Canada, 2009a	
	ED - teen	Exposure Duration	years	8	Health Canada, 2009a	
	ED - adult	Exposure Duration	years	60	Health Canada, 2009a	
	BW - infant	Body Weight	kg	8.2	Health Canada, 2009a	
	BW - toddler	Body Weight	kg	16.5	Health Canada, 2009a	
	BW - child	Body Weight	kg	32.9	Health Canada, 2009a	
	BW - teen	Body Weight	kg	59.7	Health Canada, 2009a	
	BW - adult	Body Weight	kg	70.7	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	29,200	Health Canada, 2009a	
	AT-N	Averaging Time (non-cancer)	days	1,643	Health Canada, 2009a	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.1	Health Canada, 2009a	
	RAFd	Relative Absorption Factor (dermal)	%/100	chemical-specific	Health Canada, 2009a (8)	

TABLE F.9

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL - RECREATIONAL USER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future
Medium: Soil
Exposure Medium: Soil
Receptor Population: Recreational User
Receptor Age: Toddler (1)

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*Intake Equation/ Model Name*
Inhalation	CS	Chemical Concentration in Soil	mg/kg	(2)	(2)	CDI (mg/m^3) =
	FT	Fraction Time Exposed	unitless	24/24	Professional Judgment (10)	CS x FT x EF x ED x VF x 1/AT
	EF	Exposure Frequency	days/year	70	Health Canada, 2009a (9)	
	ED - infant	Exposure Duration	years	0.5	Health Canada, 2009a	
	ED - toddler	Exposure Duration	years	4.5	Health Canada, 2009a	
	ED - child	Exposure Duration	years	7	Health Canada, 2009a	
	ED - teen	Exposure Duration	years	8	Health Canada, 2009a	
	ED - adult	Exposure Duration	years	60	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	29,200	Health Canada, 2009a	
	AT-N	Averaging Time (non-cancer)	days	1,643	Health Canada, 2009a	
	VF	Volatilization Factor	kg/m^3	chemical-specific	Refer to Table F.10	

Notes:

(1) Carcinogenic risk evaluates infant, toddler, child, teen, and adult over a 80 year lifetime. Non-carcinogenic hazard quotient evaluates toddler exposure that being the most sensitive receptor.

(2) Refer to Table F.6 for soil concentrations.

(3) Skin surface area to include hands (320 cm^2), lower arms (550/2 cm^2) and lower legs (910/2 cm^2).

(4) Skin surface area to include hands (430 cm^2), lower arms (890/2 cm^2) and lower legs (1690/2 cm^2).

(5) Skin surface area to include hands (590 cm^2), lower arms (1480/2 cm^2) and lower legs (3070/2 cm^2).

(6) Skin surface area to include hands (800 cm^2), lower arms (2230/2 cm^2) and lower legs (4970/2 cm^2).

(7) Skin surface area to include hands (890 cm^2), lower arms (2500/2 cm^2) and lower legs (5720/2 cm^2).

(8) Relative Absorption Factor (dermal) for Deildrin is 0.1.

(9) Exposure frequency based on a Recreational Land Use from Health Canada 2009a.

(10) Professional Judgment; assumes recreational user spends unlimited amount of time outside.

References:

Health Canada, 2009a: Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), DRAFT Version 2.0, May 2009.

TABLE F.10

DERIVATION OF VOLATILIZATION FACTOR (VF) FOR SOIL - RECREATIONAL USER & RESIDENT INHALATION EXPOSURE
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

VF: Soil-to-Air Volatilization Factor

$$VF = Q/C \times \frac{(3.14 \times D_A \times T)^{1/2}}{(2 \times \rho_b \times D_A)} \times 10^{-4} (m^2/cm^2)$$

				Reference	*Units*	*Chemical of Potential Concern* *Dieldrin*
	VF	=	**soil-to-air volatilization factor**		**kg/m³**	**2.49E-07**
Where:	**VF**	=	**soil-to-air volatilization factor**	Equation 4-8, USEPA, 2002	m³/kg	**4.01E+06**
	Q/C_{vol}	=	inverse of mean conc - centre of square source	Equation D-3, USEPA, 2002	(g/m²-sec)/(kg/m³)	68.18
	D_A	=	apparent diffusivity	Equation 4-8, USEPA, 2002	cm²/s	1.98E-09
	T	=	exposure interval	USEPA, 2002	s	2.52E+09
	r_b	=	soil dry bulk density	Health Canada, 2009a	g/cm³	1.70

Q/C_{vol}: Inverse of Mean Conc - Centre of Square Source

$$Q/C_{vol} = A \times \exp\frac{(\ln Area - B)^2}{C}$$

Where:	"A"	=	constant	USEPA, 2002		11.911
	Area	=	areal extent of the site or contamination	USEPA, 2002	acres	0.5
	"B"	=	constant	USEPA, 2002		18.4385
	"C"	=	constant	USEPA, 2002		209.7845

D_A: Apparent Diffusivity

$$D_A = \frac{\left[\left(\Theta_a^{10/3} D_i H' + \Theta_w^{10/3} D_w\right)/n^2\right]}{\rho_b K_d + \Theta_w + \Theta_a H'}$$

					Units	
Where:	D_A	=	apparent diffusivity	Equation 4-8, USEPA, 2002	cm²/s	1.98E-09
	Q_a	=	air-filled porosity	Health Canada, 2009a	unitless	0.239
	Q_w	=	water-filled porosity	Health Canada, 2009a	unitless	0.119
	n	=	total soil porosity	Health Canada, 2009a	unitless	0.358
	r_b	=	soil dry bulk density	Health Canada, 2009a	g/cm³	1.70
	H'	=	dimensionless Henry's Law Constant	Health Canada, 2009a	unitless	4.52E-04
	D_i	=	diffusivity of chemical x in air	Health Canada, 2009a	cm²/s	1.25E-02
	D_w	=	diffusivity of chemical x in water	Health Canada, 2009a	cm²/s	4.74E-06
	K_d	=	soil-water partition coefficient	USEPA, 2002	cm³/g	1.20E+02

Kd: Soil-Water Partition Coefficient

$$K_d = K_{oc} \times f_{oc}$$

					Units	
Where:	K_d	=	soil-water partition coefficient	USEPA, 2002	cm³/g	1.20E+02
	K_{oc}	=	soil organic carbon-water partition coefficient	Health Canada, 2009a	cm³/g	2.40E+04
	f_{oc}	=	organic content of soil	Health Canada, 2009a	g/g	0.005

References:

USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Office of Emergency and Remedial Response, OSWER 9355.4-24, December 2002.

Health Canada, 2009a: Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), DRAFT Version 2.0, May 2009.

TABLE F.11

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL - CONSTRUCTION/ UTILITY WORKER
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Receptor Population: Construction/ Utility Worker
Receptor Age: Adult

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion Rate of Soil	mg/day	100	Health Canada, 2009a	CS x IR x RAFo x CF x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	--	
	EF	Exposure Frequency	days/year	65	Health Canada, 2009a	
	ED	Exposure Duration	years	35	Health Canada, 2009a	
	BW	Body Weight	kg	70.7	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	21,900	Health Canada, 2009a (2)	
	AT-N	Averaging Time (non-cancer)	days	12,775	Health Canada, 2009a	
	RAFo	Relative Absorption Factor (oral)	%/100	1	Health Canada, 2009a	
Dermal	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	5,000	Health Canada, 2009a (3)	CS x CF x SA x AF x RAFd x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	--	
	EF	Exposure Frequency	days/year	65	Health Canada, 2009a	
	ED	Exposure Duration	years	35	Health Canada, 2009a	
	BW	Body Weight	kg	70.7	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	21,900	Health Canada, 2009a (2)	
	AT-N	Averaging Time (non-cancer)	days	12,775	Health Canada, 2009a	
	AF	Soil to Skin Adherence Factor	mg/cm^2	1	Health Canada, 2009a	
	RAFd	Relative Absorption Factor (dermal)	%/100	chemical-specific	Health Canada, 2009a (4)	
Inhalation	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	CDI (mg/m^3) =
	ET	Exposure Time	unitless	24/24	Professional Judgment (5)	CS x ET x EF x ED x VF x 1/AT
	EF	Exposure Frequency	days/year	65	Health Canada, 2009a	
	ED	Exposure Duration	years	35	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	21,900	Health Canada, 2009a (2)	
	AT-N	Averaging Time (non-cancer)	days	12,775	Health Canada, 2009a	
	VF	Volatilization Factor	kg/m^3	chemical-specific	Refer to Table F.12	

Notes:

(1) Refer to Table F.6 for soil concentrations.

(2) Averaging time is for the duration of adulthood (60 years).

(3) Skin surface area to include hands (890 cm^2), lower arms (2500/2 cm^2) and lower legs (5720/2 cm^2).

(4) Relative Absorption Factor (dermal) for Deildrin is 0.1.

(5) Professional Judgment; assumes construction worker spends unlimited amount of time outside.

References:

Health Canada, 2009a: Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), DRAFT Version 2.0, May 2009.

TABLE F.12

DERIVATION OF VOLATILIZATION FACTOR (VF) FOR SOIL - CONSTRUCTION/UTILITY WORKER INHALATION EXPOSURE
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

$$VF = (Q/C) \times 1/F_D \times ((3.14 \times D_a \times T)^{1/2}) \times 10^{-4} / (2 \times db \times D_a)$$

$$Da = ((Pa^{10/3} \times Di \times H + Pw^{10/3} \times Dw) / n^2)/(db \times Kd + Pw + Pa \times H)$$

$$Q/C_{sa} = A \times EXP [(\ln A_s - B)^2 / C]$$

$$F_D = 0.1852+(5.3537/t_c)+(-9.6318/t_c^2)$$

Input Parameters	*Reference*	*Chemical of Potential Concern* Dieldrin
VF/ volatilization factor (kg/m^3) =		**1.61E-06**
VF/ volatilization factor (m^3/kg) =	Equation 5-14, USEPA, 2002	**6.21E+05**
Da/ apparent diffusivity (cm^2/s) =	Equation 5-14, USEPA, 2002	1.98E-09
Q/C/ inverse of the mean conc. at center of square source (g/m^2-s per kg/m^3) =	Equation 5-15, USEPA, 2002	14.31
A/ constant (unitless) =	USEPA, 2002	2.4538
B/ constant (unitless) =	USEPA, 2002	17.566
C/ constant (unitless) =	USEPA, 2002	189.0426
A_s/ areal extent of site surface soil contamination (acres) =	USEPA, 2002	0.5
F_D/ dispersion correction factor (unitless) =	Equation E-16, USEPA, 2002	0.186
Pa/ air-filled soil porosity (L_{air}/L_{soil}) =	Health Canada, 2009a	0.239
Di/ diffusivity in air (cm^2/s) =	Health Canada, 2009a	1.25E-02
H/ dimensionless Henry's law constant =	Health Canada, 2009a	4.52E-04
Pw/ water-filled soil porosity (L_{water}/L_{soil}) =	Health Canada, 2009a	0.119
Dw/ diffusivity in water (cm^2/s) =	Health Canada, 2009a	4.74E-06
n/ total soil porosity (L_{pore}/L_{soil}) =	Health Canada, 2009a	0.358
db/ dry soil bulk density (g/cm^3) =	Health Canada, 2009a	1.70
Kd/ soil-water partition coefficient (cm^3/g) =	USEPA, 2002 (Kd = Koc x foc)	1.20E+02
Koc/ soil organic carbon-water partition coefficient (cm^3/g) =	Health Canada, 2009a	2.40E+04
foc/ organic carbon content of soil (g/g) =	Health Canada, 2009a	0.005
t_c/ exposure interval (hrs) =	Site-Specific	1.31E+04
T/ exposure interval (s) =	Site-Specific	4.73E+07
Conversion Factor/ 10^{-4} (m^2/cm^2) =	USEPA, 2002	1.00E-04

References:

USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Office of Emergency and Remedial Response, OSWER 9355.4-24, December 2002.

Health Canada, 2009a: Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), DRAFT Version 2.0, May 2009.

TABLE F.13

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR INDOOR AIR - RESIDENT - PROPOSED COTTAGE DEVELOPMENT AREA
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future
Medium: Soil
Exposure Medium: Indoor Air
Receptor Population: Resident
Receptor Age: Toddler (1)

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*Intake Equation/ Model Name*
Inhalation	CA	Chemical Concentration in Indoor Air	mg/m^3	(2)	(2)	CDI (mg/m^3) =
	ET	Exposure Time	unitless	24/24	Professional Judgment (3)	CA x ET x EF x ED x 1/AT
	EF	Exposure Frequency	days/year	365	Health Canada, 2009a	
	ED - infant	Exposure Duration	years	0.5	Health Canada, 2009a	
	ED - toddler	Exposure Duration	years	4.5	Health Canada, 2009a	
	ED - child	Exposure Duration	years	7	Health Canada, 2009a	
	ED - teen	Exposure Duration	years	8	Health Canada, 2009a	
	ED - adult	Exposure Duration	years	60	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	29,200	Health Canada, 2009a	
	AT-N	Averaging Time (non-cancer)	days	1,643	Health Canada, 2009a	

Notes:

(1) Carcinogenic risk evaluates infant, toddler, child, teen, and adult over a 80 year lifetime.
Non-carcinogenic hazard quotient evaluates toddler exposure that being the most sensitive receptor.

(2) Refer to Appendix I for indoor air concentration calculations and results.

(3) Professional Judgment; assumes resident spends unlimited amount of time indoors.

References:

Health Canada, 2009a: Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), DRAFT Version 2.0, May 2009.

TABLE F.14

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR ON-SITE GARDEN PRODUCE - RESIDENT - PROPOSED COTTAGE DEVELOPMENT AREA
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future
Medium: Plants
Exposure Medium: Garden Produce
Receptor Population: Resident
Receptor Age: Toddler (1)

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Soil	mg/kg	(2)	(2)	Chronic Daily Intake (CDI) (mg/kg-day) =
	BCF	Bioconcentration Factor	unitless	0.098	Travis and Arms, 1988	$[(CS \times BCF \times IR_{RV} \times CF) + (CS \times BCF \times IR_{OV} \times CF)] \times FI \times RAF \times EF \times ED \times 1/BW \times 1/AT$
	IR_{RV} - infant	Ingestion Rate of Root Vegetables	kg/day	0.083	Health Canada, 2009a	
	IR_{RV} - toddler	Ingestion Rate of Root Vegetables	kg/day	0.105	Health Canada, 2009a	
	IR_{RV} - child	Ingestion Rate of Root Vegetables	kg/day	0.161	Health Canada, 2009a	
	IR_{RV} - teen	Ingestion Rate of Root Vegetables	kg/day	0.227	Health Canada, 2009a	
	IR_{RV} - adult	Ingestion Rate of Root Vegetables	kg/day	0.188	Health Canada, 2009a	
	IR_{OV} - infant	Ingestion Rate of Other Vegetables	kg/day	0.072	Health Canada, 2009a	
	IR_{OV} - toddler	Ingestion Rate of Other Vegetables	kg/day	0.067	Health Canada, 2009a	
	IR_{OV} - child	Ingestion Rate of Other Vegetables	kg/day	0.098	Health Canada, 2009a	
	IR_{OV} - teen	Ingestion Rate of Other Vegetables	kg/day	0.120	Health Canada, 2009a	
	IR_{OV} - adult	Ingestion Rate of Other Vegetables	kg/day	0.137	Health Canada, 2009a	
	EF	Exposure Frequency	days/year	365	Health Canada, 2009a	
	ED - infant	Exposure Duration	years	0.5	Health Canada, 2009a	
	ED - toddler	Exposure Duration	years	4.5	Health Canada, 2009a	
	ED - child	Exposure Duration	years	7	Health Canada, 2009a	
	ED - teen	Exposure Duration	years	8	Health Canada, 2009a	
	ED - adult	Exposure Duration	years	60	Health Canada, 2009a	
	BW - infant	Body Weight	kg	8.2	Health Canada, 2009a	
	BW - toddler	Body Weight	kg	16.5	Health Canada, 2009a	
	BW - child	Body Weight	kg	32.9	Health Canada, 2009a	
	BW - teen	Body Weight	kg	59.7	Health Canada, 2009a	
	BW - adult	Body Weight	kg	70.7	Health Canada, 2009a	
	FI	Fraction Homegrown Produce Ingested	unitless	0.1	CCME, 2006	
	CF	Dry Weight to Wet Weight Conversion	unitless	0.2	Professional Judgment (3)	
	AT-C	Averaging Time (cancer)	days	29,200	Health Canada, 2009a	
	AT-N	Averaging Time (non-cancer)	days	1,643	Health Canada, 2009a	
	RAF	Relative Absorption Factor	%/100	1	Health Canada, 2009a	

Notes:

(1) Carcinogenic risk evaluates infant, toddler, child, teen, and adult over a 80 year lifetime. Non-carcinogenic hazard quotient evaluates toddler exposure that being the most sensitive receptor.

(2) Refer to Table F.6 for soil concentrations.

(3) Assumes homegrown produce to have 80 percent water content.

References:

Health Canada, 2009a: Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), DRAFT Version 2.0, May 2009.

Travis and Arms, 1988 : Travis, C. C. and A. D. Arms, 1988, "Bioconcentration of Organics in Beef, Milk, and Vegetation," Environmental Science and Technology, 22:271-274.

CCME, 2006. A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines, Canadian Council of Ministers of the Environment, 2006.

TABLE F.15

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR FISH - RESIDENT
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future
Medium: Fish
Exposure Medium: Fish
Receptor Population: Resident
Receptor Age: Toddler (1)

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CF	Chemical Concentration in Fish	mg/kg	(2)	(2)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR - infant	Ingestion Rate of Fish Tissue	kg fish/day	0	Health Canada, 2009a (3)	CF x IR x RAF x EF x ED x 1/BW x 1/AT
	IR - toddler	Ingestion Rate of Fish Tissue	kg fish/day	0.0088	Health Canada, 2009a (3)	
	IR - child	Ingestion Rate of Fish Tissue	kg fish/day	0.0142	Health Canada, 2009a (3)	
	IR - teen	Ingestion Rate of Fish Tissue	kg fish/day	0.0164	Health Canada, 2009a (3)	
	IR - adult	Ingestion Rate of Fish Tissue	kg fish/day	0.0175	USEPA, 2000	
	EF	Exposure Frequency	days/year	365	Health Canada, 2009a	
	ED - infant	Exposure Duration	years	0.5	Health Canada, 2009a	
	ED - toddler	Exposure Duration	years	4.5	Health Canada, 2009a	
	ED - child	Exposure Duration	years	7	Health Canada, 2009a	
	ED - teen	Exposure Duration	years	8	Health Canada, 2009a	
	ED - adult	Exposure Duration	years	60	Health Canada, 2009a	
	BW - infant	Body Weight	kg	8.2	Health Canada, 2009a	
	BW - toddler	Body Weight	kg	16.5	Health Canada, 2009a	
	BW - child	Body Weight	kg	32.9	Health Canada, 2009a	
	BW - teen	Body Weight	kg	59.7	Health Canada, 2009a	
	BW - adult	Body Weight	kg	70.7	Health Canada, 2009a	
	AT-C	Averaging Time (cancer)	days	29,200	Health Canada, 2009a	
	AT-N	Averaging Time (non-cancer)	days	1,643	Health Canada, 2009a	
	RAF	Relative Absorption Factor	%/100	1	Health Canada, 2009a	

Notes:

(1) Carcinogenic risk evaluates infant, toddler, child, teen, and adult over a 80 year lifetime. Non-carcinogenic hazard quotient evaluates toddler exposure that being the most sensitive receptor.

(2) Refer to Table F.7 for fish concentrations.

(3) Health Canada fish ingestion rates are based on subsistence fishers; however, the residents at the Site are considered recreational fishers.

Therefore, the Health Canada fish ingestion rates were adjusted to be consistent with USEPA (2000) adult recreational fisher consumption rates:

Adjusted Ingestion Rate = [(receptor fish ingestion rate (kg/day) / HC adult fish ingestion rate (kg/day)] x USEPA adult fish ingestion rate (kg-day)

toddler = (0.056 kg/day / 0.111 kg/day) x 0.0175 kg/day

child = (0.09 kg/day / 0.111 kg/day) x 0.0175 kg/day

teen = (0.104 kg/day / 0.111 kg/day) x 0.0175 kg/day

References:

Health Canada, 2009a: Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA), DRAFT Version 2.0, May 2009.

USEPA, 2000: Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1 Fish Sampling and Analysis, Third Edition, EPA 823-B-00-007, November 2000.

TABLE F.16

NON-CANCER TOXICITY DATA -- ORAL/ DERMAL ROUTE OF EXPOSURE
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Chemicals of Potential Concern (COPC)	*Chronic/ Subchronic*	*Oral/Dermal RfD Value*	*Oral/Dermal RfD Units*	*Primary Target Organ*	*Combined Uncertainty/Modifying Factors*	*Sources of RfD:*	*Dates of RfD: (1) (MM/DD/YY)*
2,4'-DDE	--	--	--	--	--	--	--
4,4'-DDD	--	--	--	--	--	--	--
4,4'-DDE	--	--	--	--	--	--	--
4,4'-DDT	chronic	1.00E-02	mg/kg-d	--	--	Health Canada	05/01/09
alpha-Chlordane	chronic	5.00E-04	mg/kg-d	liver	300	IRIS	02/07/98
Dieldrin	chronic	1.00E-04	mg/kg-d	--	--	Health Canada	05/01/09
Endrin	chronic	3.00E-04	mg/kg-d	liver	100	IRIS	04/01/91
Hexachlorobenzene	chronic	5.00E-04	mg/kg-d	--	--	Health Canada	05/01/09
Methoxychlor	chronic	1.00E-01	mg/kg-d	--	--	Health Canada	05/01/09
Mirex	chronic	2.00E-04	mg/kg-d	liver	300	IRIS	10/01/92
Trans-nonachlor	--	--	--	--	--	--	--

Notes:

(1) IRIS: Integrated Risk Information System (IRIS) Database (http://cfpub.epa.gov/ncea/iris/index.cfm). Note: date provided is the last revision date of the IRIS toxicity data provided.
Health Canada, 2009b: Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, DRAFT Version 2.0, May 2009.

TABLE F.17

NON-CANCER TOXICITY DATA -- INHALATION ROUTE OF EXPOSURE
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Chemicals of Potential Concern (COPC)	*Chronic/ Subchronic*	*Value Inhalation RfC*	*Units*	*Primary Target Organ*	*Combined Uncertainty/Modifying Factors*	*Sources of RfC*	*Dates of RfC: (1) (MM/DD/YY)*
2,4′-DDE	NA	NA	NA	NA	NA	NA	NA
4,4′-DDD	NA	NA	NA	NA	NA	NA	NA
4,4′-DDE	NA	NA	NA	NA	NA	NA	NA
4,4′-DDT	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA
Dieldrin	chronic	3.50E-04	mg/m^3	--	--	RIVM	03/01/01
Endrin	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA
Mirex	NA	NA	NA	NA	NA	NA	NA
Trans-nonachlor	NA	NA	NA	NA	NA	NA	NA

Notes:

NA = Not Applicable, pathway incomplete since COPCs are only present in fish and therefore not available for inhalation exposure.

TABLE F.18

CANCER TOXICITY DATA -- ORAL/ DERMAL ROUTE OF EXPOSURE
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Chemicals of Potential Concern (COPC)	*Oral/Dermal Cancer Slope Factor (CSF)*	*Units*	*Weight of Evidence/ Cancer Guideline Description*	*Sources of CSF:*	*Dates of CSF: (1) (MM/DD/YY)*
2,4'-DDE	--	--	--	--	--
4,4'-DDD	2.40E-01	$(mg/kg\text{-}day)^{-1}$	--	IRIS	08/22/88
4,4'-DDE	3.40E-01	$(mg/kg\text{-}day)^{-1}$	--	IRIS	08/22/88
4,4'-DDT	3.40E-01	$(mg/kg\text{-}day)^{-1}$	--	IRIS	05/01/91
alpha-Chlordane	3.50E-01	$(mg/kg\text{-}day)^{-1}$	--	IRIS	02/07/98
Dieldrin	--	--	--	--	--
Endrin	--	--	--	--	--
Hexachlorobenzene	8.30E-01	$(mg/kg\text{-}day)^{-1}$	--	Health Canada	05/01/09
Methoxychlor	--	--	--	--	--
Mirex	--	--	--	--	--
Trans-nonachlor	--	--	--	--	--

Notes:

-- = Not Available

(1) IRIS: Integrated Risk Information System (IRIS) Database (http://cfpub.epa.gov/ncea/iris/index.cfm). Note: date provided is the last revision date of the IRIS toxicity data provided.

Health Canada, 2009b: Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors, DRAFT Version 2.0, May 2009.

TABLE F.19

CANCER TOXICITY DATA -- INHALATION ROUTE OF EXPOSURE
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Chemicals of Potential Concern (COPC)	*Unit Risk Factor (URF)*	*Units*	*Weight of Evidence/ Cancer Guideline Description*	*Sources of URF:*	*Dates of URF: (1) (MM/DD/YY)*
2,4′-DDE	NA	NA	NA	NA	NA
4,4′-DDD	NA	NA	NA	NA	NA
4,4′-DDE	NA	NA	NA	NA	NA
4,4′-DDT	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA
Dieldrin	--	--	--	--	--
Endrin	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA
Mirex	NA	NA	NA	NA	NA
Trans-nonachlor	NA	NA	NA	NA	NA

Notes:

-- = Not Available

NA = Not Applicable, pathway incomplete since COPCs are only present in fish and therefore not available for inhalation exposure.

TABLE F.20

DERIVATION OF TOTAL ESTIMATED DAILY INTAKE (EDI) FOR DIELDRIN
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Total EDI = $EDI_{soil/dust} + EDI_{air} + EDI_{water} + EDI_{food}$

Parameter		*Units*	*EDI soil/dust*	*EDI air*	*EDI water*	*EDI food*	*Total EDI*
Adult Worker							
Estimated Daily Intake		ug/kg-day	0.029	0.00046	--	0.00272	0.03218
	Reference		USEPA (1)	USEPA		HC (20-39 yrs)	
Toddler							
Estimated Daily Intake		ug/kg-day	0.0053	0.000804848	--	0.00313	0.009268182
	Reference		HC/USEPA (2)	HC/USEPA (2)		HC (1-4 yrs)	

Notes:

(1) EDI based on intensive contact worker.

(2) EDIs for a toddler were calculated using Health Canada exposure assumptions and air and soil concentrations used in USEPA 2003 to derive its daily intakes

$EDI_{soil/dust}$ (ug/kg-day) = 1100 ug/kg x 80 mg/day x $1x10^{-6}$ kg/mg x 1/16.5 kg

EDI_{air} = 0.0016 ug/m3 x 8.3 m^3/d x 1/16.5 kg

References:

HC: Health Canada Average Daily Intakes of Pesticide Residue for Canadians,
'(http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/surveill/pesticide_intake-apport_pesticide_93-96-eng.pdf)

USEPA Health Effects Support Document for Aldrin/Dieldrin, EPA 822-R-03-001, February 2003.

TABLE F.21

CALCULATION OF CANCER RISKS AND NON-CANCER HAZARDS FOR RESIDENT - PROPOSED COTTAGE DEVELOPMENT
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future
Receptor Population: Resident
Receptor Age: Toddler (1)

Medium	*Exposure Medium*	*Exposure Point*	*Exposure Route*	*Chemical of Potential Concern (COPC)*	*Maximum Concentration*		*Cancer Risk Calculations*					*Non-Cancer Hazard Calculations*				
					Value	*Units*	*Intake/Exposure Concentration*		*CSF/Unit Risk*		*Cancer Risk*	*Intake/Exposure Concentration*		*RfD/RfC*		*Hazard Quotient (HQ)*
							Value	*Units*	*Value*	*Units*		*Value*	*Units*	*Value*	*Units*	
Soil	Soil	Proposed Cottage Development Area	Ingestion	Dieldrin	4.50E+00	mg/kg	1.84E-06	mg/kg-d	--	$(mg/kg-d)^{-1}$	NC	1.52E-05	mg/kg-d	1.00E-04	mg/kg-d	1.52E-01
			Dermal	Dieldrin	4.50E+00	mg/kg	2.35E-06	mg/kg-d	--	$(mg/kg-d)^{-1}$	NC	3.28E-06	mg/kg-d	1.00E-04	mg/kg-d	3.28E-02
	Ambient Air	Proposed Cottage Development Area	Inhalation	Dieldrin	4.50E+00	mg/kg	7.84E-07	mg/m^3	--	$(mg/m^3)^{-1}$	NC	7.84E-07	mg/m^3	3.50E-04	mg/m^3	2.24E-03
	Indoor Air	Proposed Cottage Development Area	Inhalation	Dieldrin	7.35E-04	$\mu g/m^3$	7.35E-07	mg/m^3	--	$(mg/m^3)^{-1}$	NC	7.35E-07	mg/m^3	3.50E-04	mg/m^3	2.10E-03
	Garden Produce	Proposed Cottage Development Area	Ingestion	Dieldrin	4.50E+00	mg/kg	4.78E-05	mg/kg-d	--	$(mg/kg-d)^{-1}$	NC	9.19E-05	mg/kg-d	1.00E-04	mg/kg-d	**9.19E-01**
Fish	Fish	On-Site	Ingestion	2,4'-DDE	1.00E-01	µg/kg	2.81E-08	mg/m^3	--	$(mg/kg-d)^{-1}$	NC	5.33E-08	mg/m^3	--	$(mg/kg-d)^{-1}$	NC
				4,4'-DDD	3.30E-01	µg/kg	9.27E-08	mg/m^3	2.40E-01	$(mg/kg-d)^{-1}$	2.22E-08	1.76E-07	mg/m^3	--	$(mg/kg-d)^{-1}$	NC
				4,4'-DDE	2.96E+00	µg/kg	8.32E-07	mg/m^3	3.40E-01	$(mg/kg-d)^{-1}$	2.83E-07	1.58E-06	mg/m^3	--	$(mg/kg-d)^{-1}$	NC
				4,4'-DDT	4.79E-01	µg/kg	1.35E-07	mg/m^3	3.40E-01	$(mg/kg-d)^{-1}$	4.58E-08	2.56E-07	mg/m^3	1.00E-02	$(mg/kg-d)^{-1}$	2.56E-05
				alpha-Chlordane	4.50E-01	µg/kg	1.26E-07	mg/m^3	3.50E-01	$(mg/kg-d)^{-1}$	4.42E-08	2.40E-07	mg/m^3	5.00E-04	$(mg/kg-d)^{-1}$	4.80E-04
				Dieldrin	9.74E-01	µg/kg	2.74E-07	mg/m^3	--	$(mg/kg-d)^{-1}$	NC	5.19E-07	mg/m^3	1.00E-04	$(mg/kg-d)^{-1}$	5.19E-03
				Endrin	2.30E-01	µg/kg	6.46E-08	mg/m^3	--	$(mg/kg-d)^{-1}$	NC	1.23E-07	mg/m^3	3.00E-04	$(mg/kg-d)^{-1}$	4.09E-04
				Hexachlorobenzene	1.81E-01	µg/kg	5.07E-08	mg/m^3	8.30E-01	$(mg/kg-d)^{-1}$	4.21E-08	9.63E-08	mg/m^3	5.00E-04	$(mg/kg-d)^{-1}$	1.93E-04
				Methoxychlor	4.79E-01	µg/kg	1.35E-07	mg/m^3	--	$(mg/kg-d)^{-1}$	NC	2.56E-07	mg/m^3	1.00E-01	$(mg/kg-d)^{-1}$	2.56E-06
				Mirex	1.30E-01	µg/kg	3.65E-08	mg/m^3	--	$(mg/kg-d)^{-1}$	NC	6.93E-08	mg/m^3	2.00E-04	$(mg/kg-d)^{-1}$	3.47E-04
				Trans-nonachlor	5.72E-01	µg/kg	1.61E-07	mg/m^3	--	$(mg/kg-d)^{-1}$	NC	3.05E-07	mg/m^3	--	$(mg/kg-d)^{-1}$	NC
			TOTAL CANCER RISK/ HQ - FISH INGESTION								4.37E-07					6.65E-03
DIELDRIN TOTAL HQ ACROSS ALL ON-SITE MEDIA unitless											--					1.11E+00
DIELDRIN ESTIMATED DAILY INTAKE (EDI), mg/kg-day (3)											--					9.27E-06
DIEDLRIN EDI DIVIDED BY TDI, unitless											--					9.27E-02
DIELDRIN TOTAL HQ (ON-SITE HQ + EDI/TDI), unitless											--				OK if < 1	**1.21E+00**

Notes:

NC = Not Calculated

(1) Carcinogenic risk evaluates infant, toddler, child, teen, and adult over a 80 year lifetime. Non-carcinogenic hazard quotient evaluates toddler exposure that being the most sensitive receptor.

(2) Calculations are based on Receptor exposure assumptions presented in Table F.8, F.13, F.14 and F.15

(3) Refer to Table F.26 for Dieldrin EDI calculations

TABLE F.22

CALCULATION OF CANCER RISKS AND NON-CANCER HAZARDS FOR RECREATIONAL USER - UNDEVELOPED AREA

HUMAN HEALTH RISK ASSESSMENT

FORMER SALMONIER CORRECTIONAL FACILITY

SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future

Receptor Population: Recreational User

Receptor Age: Toddler (1)

Medium	*Exposure Medium*	*Exposure Point*	*Exposure Route*	*Chemical of Potential Concern (COPC)*	*Maximum Concentration*		*Cancer Risk Calculations*					*Non-Cancer Hazard Calculations*				
					Value	*Units*	*Intake/Exposure Concentration*		*CSF/Unit Risk*		*Cancer Risk*	*Intake/Exposure Concentration*		*RfD/RfC*		*Hazard Quotient*
							Value	*Units*	*Value*	*Units*		*Value*	*Units*	*Value*	*Units*	
Soil	Soil	Undeveloped Area	Ingestion	Dieldrin	4.50E+00	mg/kg	5.06E-07	mg/kg-d	--	$(mg/kg\text{-}d)^{-1}$	NC	4.18E-06	mg/kg-d	1.00E-04	mg/kg-d	4.18E-02
			Dermal	Dieldrin	4.50E+00	mg/kg	6.45E-07	mg/kg-d	--	$(mg/kg\text{-}d)^{-1}$	NC	8.99E-07	mg/kg-d	1.00E-04	mg/kg-d	8.99E-03
	Ambient Air	Undeveloped Area	Inhalation	Dieldrin	4.50E+00	mg/kg	2.15E-07	mg/m^3	--	$(mg/m^3)^{-1}$	NC	2.15E-07	mg/m^3	3.50E-04	mg/m^3	6.15E-04
DIELDRIN TOTAL HQ ACROSS ALL ON-SITE MEDIA, unitless											--				OK if < 0.2	5.14E-02
DIELDRIN ESTIMATED DAILY INTAKE (EDI), mg/kg-day (3)											--					9.27E-06
DIELDRIN EDI DIVIDED BY TDI, unitless											--					9.27E-02
DIELDRIN TOTAL HQ (ON-SITE HQ + EDI/TDL), unitless											--				OK if <1	1.44E-01

Notes:

NC = Not Calculated

(1) Carcinogenic risk evaluates infant, toddler, child, teen, and adult over a 80 year lifetime. Non-carcinogenic hazard quotient evaluates toddler exposure that being the most sensitive receptor.
(2) Calculations are based on Receptor exposure assumptions presented in Table F.9
(3) Refer to Table F.26 for Dieldrin EDI calculations

TABLE F.23

CALCULATION OF CANCER RISKS AND NON-CANCER HAZARDS FOR CONSTRUCTION/UTILITY WORKER - PROPOSED COTTAGE DEVELOPMENT

HUMAN HEALTH RISK ASSESSMENT

FORMER SALMONIER CORRECTIONAL FACILITY

SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future

Receptor Population: Construction/Utility Worker

Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Exposure Route*	*Chemical of Potential Concern (COPC)*	*Maximum Concentration*		*Cancer Risk Calculations*					*Non-Cancer Hazard Calculations*				
					Value	*Units*	*Intake/Exposure Concentration*		*CSF/Unit Risk*		*Cancer Risk*	*Intake/Exposure Concentration*		*RfD/RfC*		*Hazard Quotient*
							Value	*Units*	*Value*	*Units*		*Value*	*Units*	*Value*	*Units*	
Soil	Soil	Proposed Cottage Development Area	Ingestion	Dieldrin	4.50E+00	µg/g	6.61E-07	mg/kg-d	--	$(mg/kg-d)^{-1}$	NC	1.13E-06	mg/kg-d	1.00E-04	mg/kg-d	1.13E-02
			Dermal	Dieldrin	4.50E+00	µg/g	3.31E-06	mg/kg-d	--	$(mg/kg-d)^{-1}$	NC	5.67E-06	mg/kg-d	1.00E-04	mg/kg-d	5.67E-02
	Ambient Air	Proposed Cottage Development Area	Inhalation	Dieldrin	4.50E+00	µg/g	7.53E-07	mg/m^3	--	$(mg/m^3)^{-1}$	NC	1.29E-06	mg/m^3	3.50E-04	mg/m^3	3.69E-03
DIELDRIN TOTAL HQ ACROSS ALL ON-SITE MEDIA, unitless											--				OK if < 0.2	7.17E-02
DIELDRIN ESTIMATED DAILY INTAKE (EDI), mg/kg-day (2)											--					3.22E-05
DIELDRIN EDI DIVIDED BY TDI, unitless											--					3.22E-01
DIELDRIN TOTAL HQ (ON-SITE HQ = EDI/TDI), unitless											--				OK if < 1	3.93E-01

Notes:

NC = Not Calculated

TABLE F.24

SUMMARY OF RESIDENT RISKS AND HAZARDS FOR COPCs - PROPOSED COTTAGE DEVELOPMENT
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future
Receptor Population: Resident
Receptor Age: Toddler (1)

Medium	*Exposure Medium*	*Exposure Point*	*Chemicals of Potential Concern (COPC)*	*Carcinogenic Risk*				*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*	*Primary Target Organ(s)*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Soil	Soil	Proposed Cottage Development Area	Dieldrin	NC	NC	NC	NC	--	1.52E-01	2.24E-03	3.28E-02	1.87E-01
	Indoor Air		Dieldrin	NC	NC	NC	NC	--	NC	2.10E-03	NC	2.10E-03
	Vegetables		Dieldrin	NC	NC	NC	NC	--	9.19E-01	NC	NC	**9.19E-01**
Fish	Fish	On-Site	2,4'-DDE	NC	NC	NC	NC	--	NC	NC	NC	NC
			4,4'-DDD	2.22E-08	NC	NC	2.22E-08	--	NC	NC	NC	NC
			4,4'-DDE	2.83E-07	NC	NC	2.83E-07	--	NC	NC	NC	NC
			4,4'-DDT	4.58E-08	NC	NC	4.58E-08	--	2.56E-05	NC	NC	2.56E-05
			alpha-Chlordane	4.42E-08	NC	NC	4.42E-08	liver	4.80E-04	NC	NC	4.80E-04
			Dieldrin	NC	NC	NC	NC	--	5.19E-03	NC	NC	5.19E-03
			Endrin	NC	NC	NC	NC	liver	4.09E-04	NC	NC	4.09E-04
			Hexachlorobenzene	4.21E-08	NC	NC	4.21E-08	--	1.93E-04	NC	NC	1.93E-04
			Methoxychlor	NC	NC	NC	NC	--	2.56E-06	NC	NC	2.56E-06
			Mirex	NC	NC	NC	NC	liver	3.47E-04	NC	NC	3.47E-04
			Trans-nonachlor	NC	NC	NC	NC	--	NC	NC	NC	NC
		Total Cancer Risk/ HQ - Fish Ingestion				OK if < 1E-05	4.37E-07				OK if < 0.2	6.65E-03
DIELDRIN TOTAL HQ ACROSS ALL ON-SITE MEDIA, unitless							--					1.11E+00
DIELDRIN ESTIMATED DAILY INTAKE (EDI), mg/kg-day							--					9.27E-06
DIEDLRIN EDI DIVIDED BY TDI, unitless							--					9.27E-02
DIELDRIN TOTAL HQ (ON-SITE HQ + EDI/TDI), unitless							--				OK if <1	**1.21E+00**

Notes:

NC = Not Calculated

(1) Carcinogenic risk evaluates infant, toddler, child, teen, and adult over a 80 year lifetime. Non-carcinogenic hazard quotient evaluates toddler exposure that being the most sensitive receptor.

(3) Refer to Table F.26 for Dieldrin EDI calculations

TABLE F.25

SUMMARY OF RECREATIONAL USER RISKS AND HAZARDS FOR COPCs - UNDEVELOPED AREA

HUMAN HEALTH RISK ASSESSMENT

FORMER SALMONIER CORRECTIONAL FACILITY

SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future

Receptor Population: Recreational User

Receptor Age: Toddler (1)

Medium	*Exposure Medium*	*Exposure Point*	*Chemicals of Potential Concern (COPC)*	*Carcinogenic Risk*				*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*	*Primary Target Organ(s)*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Soil	Soil	Undeveloped Area	Dieldrin	NC	NC	NC	NC	--	4.18E-02	6.15E-04	8.99E-03	5.14E-02
DIELDRIN TOTAL HQ ACROSS ALL ON-SITE MEDIA, unitless							--				OK if < 0.2	5.14E-02
DIELDRIN ESTIMATED DAILY INTAKE (EDI), mg/kg-day (2)							--					9.27E-06
DIELDRIN EDI DIVIDED BY TDI, unitless							--					9.27E-02
DIELDRIN TOTAL HQ (ON-SITE HQ = EDI/TDI), unitless							--				OK if <1	1.44E-01

Notes:

NC = Not Calculated

(1) Carcinogenic risk evaluates infant, toddler, child, teen, and adult over a 80 year lifetime. Non-carcinogenic hazard quotient evaluates toddler exposure that being the most sensitive receptor.

(3) Refer to Table F.26 for Dieldrin EDI calculations

TABLE F.26

SUMMARY OF CONSTRUCTION/UTILITY WORKER RISKS AND HAZARDS FOR COPCs - PROPOSED COTTAGE DEVELOPMENT AREA

HUMAN HEALTH RISK ASSESSMENT

FORMER SALMONIER CORRECTIONAL FACILITY

SALMONIER, NEWFOUNDLAND AND LABRADOR

Scenario Timeframe: Current/ Future

Receptor Population: Construction/Utility Worker

Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemicals of Potential Concern (COPC)*	*Carcinogenic Risk*				*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*	*Primary Target Organ(s)*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Soil	Soil	Proposed Cottage Development Area	Dieldrin	NC	NC	NC	NC	--	1.13E-02	3.69E-03	5.67E-02	7.17E-02
DIELDRIN TOTAL HQ ACROSS ALL ON-SITE MEDIA, unitless							--				OK if < 0.2	7.17E-02
DIELDRIN ESTIMATED DAILY INTAKE (EDI) , mg/kg-day (1)							--					3.22E-05
DIELDRIN EDI DIVIDED BY DIELDRIN TDI, unitless							--					3.22E-01
DIELDRIN TOTAL HQ (All On-site Media + EDI/ TDI), unitless							--				OK if < 1	3.93E-01

Note:

NC = Not Calculated

(1) Refer to Table F.26 for Dieldrin EDI calculations

TABLE F.27

DERIVATION OF SITE-SPECIFIC TARGET LEVELS (SSTLs) FOR SOIL TO PLANT - RESIDENT ORAL EXPOSURE
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Chemical of Potential Concern	*CSF oral 1/(mg/kg-d)*	*RfD oral (mg/kg-d)*	*Relative Absorption Factor Oral (%/100)*	*Resident Cancer (1) (mg/kg)*	*Resident Non-Cancer (2) (mg/kg)*	*Site-Specific Target Level $SSTL_{soil}$ (3) (mg/kg)*
Pesticides						
Dieldrin	--	1.00E-04	1	NV	9.79E-01	0.98

Notes:

-- = Not Available

NV = No Value

(1) Carcinogenic risk includes infant, toddler, child, teen and adult over a 80 year lifetime.

(2) Non-carcinogenic hazard quotient based on toddler, that being the most conservative receptor.

(3) The selected Site-Specific Target Level is the lower of the carcinogenic-based concentration and the non-carcinogenic-based concentration.

Resident Exposure Assumptions

Site-Specific Target Level in Soil to Plant (mg/kg)	$SSTL_{soil}$	calculated	
Target Risk Level (unitless)	TR	1.0E-05	Health Canada, 2009a
Target Hazard Level (unitless)	THQ	0.2	Health Canada, 2009a
Cancer Slope Factor (per mg/kg-day)	CSF	chemical-specific	Refer to Table F.18
Reference Dose Factor (mg/kg-day)	RfD	chemical-specific	Refer to Table F.16
Ingestion Rate of Root Vegetables (kg/day) - Infant	IR_{RV} - infant	0.083	Refer to Table F.14
Ingestion Rate of Root Vegetables (kg/day) - Toddler	IR_{RV} - toddler	0.105	Refer to Table F.14
Ingestion Rate of Root Vegetables (kg/day) - Child	IR_{RV} - child	0.161	Refer to Table F.14
Ingestion Rate of Root Vegetables (kg/day) - Teen	IR_{RV} - teen	0.227	Refer to Table F.14
Ingestion Rate of Root Vegetables (kg/day) - Adult	IR_{RV} - adult	0.188	Refer to Table F.14
Ingestion Rate of Other Vegetables (kg/day) - Infant	IR_{OV} - infant	0.072	Refer to Table F.14
Ingestion Rate of Other Vegetables (kg/day) - Toddler	IR_{OV} - toddler	0.067	Refer to Table F.14
Ingestion Rate of Other Vegetables (kg/day) - Child	IR_{OV} - child	0.098	Refer to Table F.14
Ingestion Rate of Other Vegetables (kg/day) - Teen	IR_{OV} - teen	0.12	Refer to Table F.14
Ingestion Rate of Other Vegetables (kg/day) - Adult	IR_{OV} - adult	0.137	Refer to Table F.14
Bioconcentration Factor (unitless)	BCF	0.098	Refer to Table F.14
Fraction Homegrown Produce Ingested (unitless)	F1	0.1	Refer to Table F.14
Dry Weight to Wet Weight Conversion (unitless)	CF	0.2	Refer to Table F.14
Relative Absorption Factor - Oral (%/100)	RAFo	1	Refer to Table F.14
Exposure Frequency (days/year)	EF	365	Refer to Table F.14
Exposure Duration (years) - Infant	ED	0.5	Refer to Table F.14
Exposure Duration (years) - Toddler	ED	4.5	Refer to Table F.14
Exposure Duration (years) - Child	ED	7	Refer to Table F.14
Exposure Duration (years) - Teen	ED	8	Refer to Table F.14
Exposure Duration (years) - Adult	ED	60	Refer to Table F.14
Body Weight (kg) - Infant	BW	8.2	Refer to Table F.14
Body Weight (kg) - Toddler	BW	16.5	Refer to Table F.14
Body Weight (kg) - Child	BW	32.9	Refer to Table F.14
Body Weight (kg) - Teen	BW	59.7	Refer to Table F.14
Body Weight (kg) - Adult	BW	70.7	Refer to Table F.14
Averaging Time - carc. (days)	ATc	29,200	Refer to Table F.14
Averaging Time - noncarc. (days)	ATnc	1,643	Refer to Table F.14

Exposure Equations

Carcinogenic Endpoints:

$$SSTL_{soil} = \frac{TR \times ATc}{[CSF \times (IR_{RV} + IR_{OV}) \times BCF \times CF \times FI \times EF \times ED \times RAFo]/BW}$$

Non-Carcinogenic Endpoints:

$$SSTL_{soil} = \frac{THQ \times ATnc}{[(1/RfD) \times (IR_{RV} + IR_{OV}) \times BCF \times CF \times FI \times EF \times ED \times RAFo)/BW}$$

TABLE F.28

DERIVATION OF SITE-SPECIFIC TARGET LEVELS (SSTLs) FOR SOIL - RESIDENT ORAL, DERMAL, AND INHALATION EXPOSURE
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Chemical of Potential Concern (COPC)	*CSF*		*URF*	*RfD*		*RfC*	*Relative Absorption Factor*		*VF*	*Resident*		*Site-Specific Target Levels*
	oral	*dermal*	*inhalation*	*oral*	*dermal*	*inhalation*	*Oral*	*Dermal*		*Cancer (1)*	*Non-Cancer (2)*	*SSTL $_{soil}$ (3)*
	1/(mg/kg-d)	*1/(mg/kg-d)*	*1/(mg/m^3)*	*(mg/kg-d)*	*(mg/kg-d)*	*(mg/m^3)*	*(%/100)*	*(%/100)*	*(kg/m^3)*	*(mg/kg)*	*(mg/kg)*	*(mg/kg)*
Pesticides												
Dieldrin	--	--	--	1.00E-04	1.00E-04	3.50E-04	1	0.1	2.49E-07	NV	4.80E+00	4.80

Notes:

-- = Not Available

NV = No Value

(1) Carcinogenic risk includes infant, toddler, child, teen and adult over a 80 year lifetime.

(2) Non-carcinogenic hazard quotient based on toddler, that being the most conservative receptor.

(3) The selected Site-Specific Target Level is the lower of the carcinogenic-based concentration and the non-carcinogenic-based concentration.

Resident Exposure Assumptions

Site-Specific Target Level in Soil (mg/kg)	$SSTL_{soil}$	calculated	
Target Risk Level (unitless)	TR	1.0E-05	Health Canada, 2009a
Target Hazard Level (unitless)	THQ	0.2	Health Canada, 2009a
Cancer Slope Factor (per mg/kg-day)	CSF	chemical-specific	Refer to Table F.18
Reference Dose Factor (mg/kg-day)	RfD	chemical-specific	Refer to Table F.16
Unit Risk Factor (1/(mg/m^3))	URF	chemical-specific	Refer to Table F.19
Reference Concentration (mg/m^3)	RfC	chemical-specific	Refer to Table F.17
Ingestion Rate (mg/day) - Infant	IR	20	Refer to Table F.8
Ingestion Rate (mg/day) - Toddler	IR	80	Refer to Table F.8
Ingestion Rate (mg/day) - Child	IR	20	Refer to Table F.8
Ingestion Rate (mg/day) - Teen	IR	20	Refer to Table F.8
Ingestion Rate (mg/day) - Adult	IR	20	Refer to Table F.8
Relative Absorption Factor - Oral (%/100)	RAFo	chemical-specific	Refer to Table F.8
Surface Area Exposed (cm^2/day) - Infant	SA	1,050	Refer to Table F.8
Surface Area Exposed (cm^2/day) - Toddler	SA	1,720	Refer to Table F.8
Surface Area Exposed (cm^2/day) - Child	SA	2,865	Refer to Table F.8
Surface Area Exposed (cm^2/day) - Teen	SA	4,400	Refer to Table F.8
Surface Area Exposed (cm^2/day) - Adult	SA	5,000	Refer to Table F.8
Adherence Factor (mg/cm^2)	AF	0.1	Refer to Table F.8
Relative Absorption Factor - Dermal (%/100)	RAFd	chemical-specific	Refer to Table F.8
Exposure Time (hrs/day)	ET	24/24	Refer to Table F.8
Exposure Frequency (days/year)	EF	255	Refer to Table F.8
Exposure Duration (years) - Infant	ED	0.5	Refer to Table F.8
Exposure Duration (years) - Toddler	ED	4.5	Refer to Table F.8
Exposure Duration (years) - Child	ED	7	Refer to Table F.8
Exposure Duration (years) - Teen	ED	8	Refer to Table F.8
Exposure Duration (years) - Adult	ED	60	Refer to Table F.8
Body Weight (kg) - Infant	BW	8.2	Refer to Table F.8
Body Weight (kg) - Toddler	BW	16.5	Refer to Table F.8
Body Weight (kg) - Child	BW	32.9	Refer to Table F.8
Body Weight (kg) - Teen	BW	59.7	Refer to Table F.8
Body Weight (kg) - Adult	BW	70.7	Refer to Table F.8
Conversion Factor (kg/mg)	CF	1.0E-06	
Averaging Time - carc. (days)	ATc	29,200	Refer to Table F.8
Averaging Time - noncarc. (days)	ATnc	1,643	Refer to Table F.8
Volatilization Factor (kg/m^3)	VF	chemical-specific	Refer to Table F.10

APPENDIX G

STATISTICAL METHODOLOGY

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1.0 INTRODUCTION

A key element of the risk assessment process is the estimation of the concentration of a chemical in the environment (USEPA, 2002). The concentration used is termed the exposure point concentration (EPC), which is a conservative estimate of the average concentration within an environmental medium (USEPA, 2002).

The EPCs applied in the risk assessment process were developed based on the reasonable maximum exposure (RME) scenario. In this scenario, a conservative 95 percent upper confidence limit (UCL) of the mean was used as an estimate of the exposure term. The determination of 95 percent UCLs are statistically based and driven by characteristics of the data. Key factors determining the statistical methodologies employed include: (i) the probability distribution of the observed data (e.g., normal vs. gamma-distributed vs. lognormal, etc.); and (ii) the proportion of censored data (non-detected results) present.

The following sections present the procedures used to determine the 95 percent UCL values of the contaminants of concern (COPCs) in this risk assessment. A number of guidance documents were consulted in developing the statistical methodologies including USEPA (1989), USEPA (1992) updated by USEPA (2002), USEPA (1997), USEPA (2003), USEPA (2006a), USEPA (2006b), USEPA (2009a), USEPA (2009b), and MOE (1997).

The 95 percent UCL methods used have been selected to be consistent with USEPA's ProUCL Version 4.00.04 software, which was released on May 13, 2009. The methods incorporated in this software are described in USEPA (2009a, 2009b), which have been used as the primary reference documents for the UCL methodologies.

The EPC calculation methodologies employed are discussed in the following sections:

- Section 1.0 Introduction
- Section 2.0 Statistical Procedures for Selecting UCL Methods
- Section 3.0 UCL Calculation Methods
- Section 4.0 Maximum Detected Value
- Section 5.0 References

2.0 STATISTICAL PROCEDURES FOR SELECTION OF EPC METHODS

The development of EPC estimates is performed for each COPC separately using a four step process consisting of: (i) determining the percentage of non-detects present, (ii) pre-screening data for elevated detection limits, (iii) data distribution testing, and (iv) selecting and implementing an appropriate statistical method for EPC estimate calculations.

2.1 PERCENTAGE OF CENSORED DATA (NON-DETECTS)

The first step of the statistical evaluation is to determine the percentage of the non-detects present in each data set. Suggested approaches to account for the presence of non-detect analytical results are outlined in USEPA (2009a, 2006b). The primary technique recommended to account for non-detects in data sets is the Kaplan-Meier (KM) product limit estimation method (Kaplan & Meier, 1958). This procedure is described in detail in Section 3.3 below, and uses the numerical values of the detected results in conjunction with the proportions of non-detect results at different detection limits in order to determine estimates of the population mean and standard error for use in UCL calculations. USEPA (2009a, 2006b) recommends different UCL computation methods based on the level of non-detects present, as well as other data distribution characteristics, as indicated in Section 2.3 below.

2.2 DATA PRE-PROCESSING FOR ELEVATED DETECTION LIMITS

The second step of the analysis screens the data set for the presence of data consisting of non-detect results with elevated detection limits. Such data are of limited value in EPC determination, since they have high uncertainty associated with them (i.e., the analyte may or may not be present at a concentration between zero and the high detection limit). In such cases, where sufficient additional data points (detected values or non-detects with lower detection limits), the high detection limit data may be removed from the data set prior to UCL calculations applying the following logic:

- For data sets with 10 or fewer data points, all data are retained
- For data sets with between 10 and 100 data points, and containing up to 25 percent non-detect results with elevated detection limits, the high detection limit data are removed from UCL calculations

- For data sets with greater than 100 data points, and containing up to 50 percent non-detect results with elevated detection limits, the high detection limit data are removed from UCL calculations

2.3 DATA DISTRIBUTION TESTING

The third step in determining an appropriate UCL method for each data set is to determine the statistical data distribution. Each data set is classified as being described by one of the following distributions (in descending order). In any cases where the data fit more than one distribution, the distribution highest on this list is selected (e.g., if a set of data may be described by either a normal or lognormal distribution based on testing, a normal distribution assumption is made), unless further testing is performed to demonstrate that one distribution fits the data better than the others.

i) Normal Distribution

ii) Gamma Distribution

iii) Lognormal Distribution

iv) None of the above (in which case a non-parametric UCL is required)

Details regarding the distribution testing needed for each of these methods are given in the following sections.

2.3.1 NORMAL DISTRIBUTION TESTING

To test a data set for normality, the Shapiro-Wilk W-test (1965), which was later extended for large sample sizes by Royston, (1982), was used. This test is statistically robust and is considered one of the best numerical tests of normality. The test is especially sensitive to detecting deviations in the extreme tails of the distribution. The following steps are employed to perform the Shapiro-Wilk W-test:

i) The sample data are ordered from smallest to largest

ii) A weighted sum (b) of differences between the most extreme observations is calculated

$$b = \sum_{i=1}^{k} a_{(n-i+1)}\left(x_{(n-i+1)} - x_i\right) = \sum_{i=1}^{k} b_i$$

where:

x_i is the smallest ordered value in the sample
n is the number of samples
k is the largest integer less than or equal to $n/2$
a_i is a coefficient from standard tables dependent on the sample size n

A table of a_i coefficients is attached to this Appendix (Table 1).

iii) The weighted sum is divided by a multiple of the standard deviation (S) to yield the Shapiro-Wilk statistic (W)

$$W = \left\{ \frac{b}{S\sqrt{n-1}} \right\}^2$$

iv) The calculated W is compared against a critical value (W_{crit}) taken from a standard statistical table (see Table 2). If W is greater than W_{crit} then the data are concluded to be normally distributed at the selected level of significance

2.3.2 GAMMA DISTRIBUTION TESTING

Gamma parameter estimation and distribution testing were performed using the methods presented in the ProUCL 4.00.04 Technical Guide (USEPA, 2009a), including the Kolmogorov-Smirnov and Anderson-Darling tests.

Prior to performing a test of goodness-of-fit for the gamma distribution, two gamma parameters must be determined. These parameters are: (i) the shape parameter κ; and (ii) the scale parameter θ. Estimation of the parameters is performed as described in Section 2.3.2 of the Draft ProUCL 4.00.04 Technical Guide (USEPA, 2009a). Specifically, the maximum likelihood estimators were calculated as follows.

Step 1) Define an approximation of the Digamma function $\Psi(\kappa)$ as:

$$\Psi(\kappa) \approx \ln(\kappa) - \left\{1 + \left[1 - (1/10 - 1/(21\kappa^2))/\kappa^2\right]/(6\kappa)\right\}/(2\kappa) \qquad \text{for } \kappa \geq 8; \text{ and}$$

$$\Psi(\kappa) = \Psi(\kappa+1) - 1/\kappa \qquad \text{for } \kappa < 8 \text{ (iterative formula)}$$

Step 2) Define an approximation of the Trigamma function $\Psi'(\kappa)$ as:

$$\Psi'(\kappa) \approx \left\{1 + \left\{1 + \left[1 - (1/5 - 1/(7\kappa^2))\right]/(3\kappa)\right\}/(2\kappa)\right\}/\kappa \qquad \text{for } \kappa \geq 8; \text{ and}$$

$$\Psi'(\kappa) = \Psi'(\kappa+1) - 1/\kappa^2 \qquad \text{for } \kappa < 8 \text{ (iterative formula)}$$

Step 3) Define an initial estimate of κ as:

$$\kappa_0 = 1/2M \qquad \text{where,}$$

$$M = \ln(\bar{x}) - \frac{1}{n}\sum \ln(x_i)$$

Step 4) Solve for κ iteratively using the following formula until convergence occurs (typically fewer than 10 iterations for convergence to 5+ significant figures).

$$\hat{\kappa}_l = \hat{\kappa}_{l-1} - \frac{\ln(\hat{\kappa}_{l-1}) - \Psi(\hat{\kappa}_{l-1}) - M}{1/\hat{\kappa}_{l-1} - \Psi'(\hat{\kappa}_{l-1})}$$

Step 5) Calculate θ using the relationship:

$$\hat{\theta} = \bar{x} / \hat{\kappa}$$

where $\bar{x}$ is the mean of the data set.

These estimated expected values (designated by the ^ character over κ and θ, and termed "k hat" and "Theta hat", respectively, in ProUCL Version 4.00.04 guidance) are used in the data distribution testing below, and in the gamma UCL calculations presented in Section 3.

The Kolmogorov-Smirnov and Anderson-Darling goodness-of-fit tests are empirical distribution function (EDF) tests that can be used to test a gamma distribution (as well as other distributions). The steps in performing these tests using the gamma parameters calculated above are as follow:

Step 1) Let F(x) be the cumulative distribution function (CDF) of the gamma random variable X. Let Z=F(X), where Z represents a uniform U(0,1) random variable. For each data point x_i compute z_i using the incomplete gamma function.

$$z_i = F(x_i) \qquad ; i=1,2,\ldots,n$$

Note that the incomplete gamma function is available using the Microsoft Excel GAMMADIST function with x_i, κ and θ as arguments. It may alternatively be calculated using the algorithm in Press et al. (1990), the details of which are not provided here.

Step 2) Arrange the resulting z_i in ascending order as $z_1 \le z_2 \le \ldots \le z_n$

Let $\bar{z} = \sum z_i / n$ be the mean of the z_i; i=1,2,…,n.

Step 3) For the Kolmogorov-Smirnov test, calculate the following two test statistics:

$$D^+ = \max_i \{1/n - z_i\} \qquad \text{and} \qquad D^- = \max_i \{z_i - (i-1)/n\}$$

Then, the Kolmogorov-Smirnov test statistic is given by $D = \max(D^+, D^-)$.

Step 4) For the Anderson-Darling test, calculate the following test statistic:

$$A^2 = -n - (1/n)\sum_1^n \{(2i-1)[\log(z_i) + \log(1 - z_{(n+1-i)})]\}$$

Step 5) Compare the D and A^2 statistics to tabulated critical values (Tables 3 and 4). If the calculated values (from Steps 3 and 4) are less than the tabulated critical values, then the data are gamma distributed. If the calculated values are greater than the tabulated critical values, then the hypothesis of a gamma distribution is rejected.

2.3.3 LOGNORMAL DISTRIBUTION TESTING

Testing for a lognormal distribution is carried out by transforming the original data set by taking the natural logarithms ($\log_e$ or ln) of the data and then applying the Shapiro-Wilk W-test as described for the normal distribution above (Section 2.3.1).

2.4 SELECTION OF 95 PERCENT UCL METHODS

Methods for determining the 95 percent UCL values are discussed in USEPA (2002) (which updates USEPA 1992), USEPA (2004), USEPA (2006b), USEPA (2009a), and USEPA (2009b). Recommended 95 percent UCL methods are available in the ProUCL Version 4.00.04 Technical and User Guides (USEPA, 2009a,b). These recommendations have been followed in the selection of 95 percent UCL methods.

A UCL method decision flowchart is presented on Figure 1, which illustrates the decision process described in Tables 5a, 5b, and 5c to determine which 95 percent UCL method is appropriate to use.

3.0 95 PERCENT UPPER CONFIDENCE LIMIT (UCL) CALCULATION METHODS

The following sections discuss the calculation procedures used to produce 95 percent UCL estimates. The selection of an appropriate method for each data set is presented above in Section 2.

3.1 UN-DETECTED ANALYTES (100 PERCENT NON-DETECT DATA SETS), SMALL DATA SETS (N < 5), AND FEW DETECTED VALUES (< 4)

In most cases for chemicals that have not been detected in an environmental medium, such analytes are not considered as COPCs under USEPA's Risk Assessment Guidance for Superfund (RAGS, USEPA 1989). However, when a non-detected analyte must be retained as a COPC for other site-specific reasons (e.g., a primary component of a waste stream), USEPA (2009b) recommends using the maximum reporting limit (RL) for the EPC value. This approach has been applied, subject to screening for atypically high detection limits occurring infrequently (i.e., no more than once in twenty observations) in the data set.

In cases where the number of data points is small (fewer than 5 observations), statistics are not considered reliable and USEPA (2009a,b) recommends that the maximum value (detect or reported detection limit) be used. Note that the uncertainties in this case (i.e., a small data set containing few detected values) are high, and it is always recommended to collect more samples in order to better characterize the study area.

For data sets containing five or more observations, but having only four or fewer detected values, special treatment is recommended by USEPA (2009a) in determining EPCs:

- For 0 to 1 detected values, no statistics are possible, and a UCL is not calculable. In these cases, the maximum value (detect or detection limit) is used as the EPC
- For 2 detected values, KM procedures only should be applied to any UCL method selected
- For 3 detected values, most statistical calculations should be performed, but not using gamma distribution methods

USEPA also makes a general recommendation that efforts should be made to collect a data set with approximately 8 to 10 detected observations minimum.

The approaches described above have been followed during EPC calculations for data sets containing high percentages of non-detects and for small data sets. The details of all the procedures used are shown in Table 5a.

3.2 STUDENT'S-*t* UCL (ALL DATA DETECTED VALUES)

The arithmetic mean and standard deviation of the data are calculated, and the 95 percent UCL value is found using the following equation.

$$95\%\text{UCL} = \bar{x} + t_{(0.05,n-1,1)} \bullet s / \sqrt{n}$$

where:

$\bar{x}$	=	mean of the substituted data set
$t_{(0.05, n-1, 1)}$	=	student *t*-statistic for a one-tailed 95 percent confidence (α=0.05) and n-1 degrees of freedom
s	=	standard deviation of the substituted data set
n	=	number of samples

3.3 STUDENT'S-*t* UCL (DATA SETS CONTAINING NON-DETECTS)

For data sets containing non-detect data, the Kaplan-Meier (KM) method is used to generate estimates of the population mean ($\hat{\mu}$) and its standard error ($\hat{\sigma}_{SE}$) as follows:

Let $x_1, x_2, \ldots, x_n$ represent n observed values obtained from samples collected.
Let $x'_1, < x'_2, \ldots, < x'_n$ denote the n' distinct COPC concentrations observed.
Therefore, n'<n.

Let m_j denote the number of detects at x'_j.
Let n_j represent n data values detected in samples collected at x_j.

Step 1) Define a cumulative distribution function $\tilde{F}(x)$ as:

$$\tilde{F}(x) = 1, \quad when\ x \geq x'_{n'}$$

$$\tilde{F}(x) = \prod_{j\ such\ that\ x'_j > x} \frac{m_j - n_j}{n_j}, \quad when\ x'_1 \leq x \leq x'_{n'}$$

$$\tilde{F}(x) = \tilde{F}(x'_1), \quad when\ x_{(1)} \leq x \geq x'_1$$

$$\tilde{F}(x) = 0\ or\ undefined, \quad when\ 0 \leq x \geq x_{(1)}$$

Step 2) Calculate the KM population mean $(\hat{\mu})$ as:

$$\hat{\mu} = \sum_{i=1}^{n'} x' \left[\tilde{F}(x'_i) - \tilde{F}(x'_{i-1})\right], where, x_0 = 0.$$

Step 3) Calculation of the KM standard error $(\hat{\sigma}_{SE})$ of the mean as:

$$\hat{\sigma}_{SE} = \sqrt{\frac{n-k}{n-k-1} \sum_{i=1}^{n'-i} a_i^2 \frac{m_{i+1}}{n_{i+1}(n_{i+1} - m_{i+1})}}$$

where:

k = the number of observations below the detection limit and

$$a_i = \sum_{j=1}^{i} (x'_{j+1} - x'_j)\, \tilde{F}(x'_j), \quad i := 1,2,..., n' - 1.$$

The calculation of a 95 percent UCL using these Kaplan-Meier estimates is then accomplished using the following equation:

$$95\%\text{UCL} = \hat{\mu} + t_{(0.05, n-1, 1)} \bullet \hat{\sigma}_{SE}$$

where:

$\hat{\mu}$ = Kaplan-Meier estimate of the population mean (see above)

$t_{(0.05, n-1, 1)}$ = student t-statistic for a one-tailed 95 percent confidence (α=0.05) and n-1 degrees of freedom

$\hat{\sigma}_{SE}$ = Kaplan-Meier estimate of the population standard error (see above)

3.4 APPROXIMATE GAMMA UCL

To calculate the Approximate Gamma UCL, the following formula is used:

$$UCL = 2n\hat{k}^{*}\bar{x} / \chi^{2}_{2n\hat{k}^{*}}(\alpha)$$

where:

n = the number of samples

$\hat{k}^{*}$ = the bias-corrected estimate of $\hat{k}$; $\hat{k}^{*} = (n-3)\hat{k}/n + 2/(3n)$

$\bar{x}$ = the sample mean

$\chi^{2}_{2n\hat{k}^{*}}(\alpha)$ = the cumulative chi-square distribution at α (=0.05 for a 95 percent confidence limit) with $2n\hat{k}^{*}$ degrees of freedom (e.g., interpolated from Table 6).

3.5 ADJUSTED GAMMA UCL

To calculate the Adjusted Gamma UCL, the following formula is used:

$$UCL = 2n\hat{k}^{*}\bar{x} / \chi^{2}_{2n\hat{k}^{*}}(\alpha')$$

which is the same formula as for the Approximate Gamma UCL above, but an adjusted level of α, α', is used based on the values found in, or interpolated from, Table 7.

3.6 BOOTSTRAP-*t* UCL

To calculate the UCL based on the Bootstrap-*t* method, the following steps are performed:

Step 1) Calculate estimates of the population mean $\hat{\mu}$ and its standard error $\hat{\sigma}_{SE}$ using the KM method as described previously.

Step 2) Re-sample the original data a very large number of times (in this case thousands of times) using a sample size equal to the original number of samples and calculate each resample set's estimated population mean ($\hat{\mu}_b$) and standard deviation ($\hat{\sigma}_{SE_b}$), using the KM methods.

Step 3) For each re-sample set calculate the value.

$$t_b = \frac{(\hat{\mu}_b - \hat{\mu})}{\sigma_{SE\,b}} \times \sqrt{n}$$

where n is the number of samples.

Step 4) Sort the t_b values from the lowest to the highest, and select the pivotal quantity $t_{(\alpha N)}$, where N is the number of bootstrap sets. For example, if 10,000 bootstrap sets are generated and α=0.05, select the 500th (0.05 x 10000) lowest t_b value.

Step 5) Calculate the Bootstrap-*t* 95 percent UCL estimate as:

$$95\%\text{UCL} = \hat{\mu} - t_{(\alpha N)} \bullet \frac{\sigma_{SE}}{\sqrt{n}}$$

where:

$\hat{\mu}$ = KM estimate of the population mean
$\hat{\sigma}_{SE}$ = KM estimate of the standard error of the population mean
n = sample size
$t_{(\alpha N)}$ = is the pivotal quantity defined in Step (4)

3.7 HALL'S BOOTSTRAP UCL

To calculate a Hall's Bootstrap UCL, a number of steps are required, as follow:

Step 1) Compute the arithmetic mean ($\bar{x}$).

Step 2) Compute the standard deviation (s).

Step 3) Compute the skewness (k).

Step 4) Re-sample the data a very large number of times (thousands of re-sample sets were used during EPC calculations) selecting the same number of re-sampled data each time equal to the number of samples in the initial data set. Calculate each bootstrap set's mean $\bar{x}_b$, standard deviation s_b and skewness k_b.

Step 5) For each bootstrap set, calculate the studentized mean (W_b):

$$W_b = \frac{(\bar{x}_b - \bar{x})}{s_b}$$

Step 6) For each bootstrap set, calculate Hall's statistic:

$$Q_b = W + \frac{k_b W^2}{3} + \frac{k_b^2 W^3}{27} + \frac{k_b}{6n}$$

Step 7) Sort all the Q_b values (lowest to highest) and select the lower α^{th} quantile ($Q\alpha$) of the B re-sample sets. This is the $(\alpha B)^{th}$ lowest value (e.g., for 10,000 resample sets and α=0.05, select $Q\alpha$ = the 500th lowest value).

Step 8) Compute the following quantity:

$$W(Q_\alpha) = \frac{3}{k}\left[\sqrt[3]{1 + \left(Q_\alpha - \frac{k}{6n}\right)} - 1\right]$$

where n is the number of samples.

Step 9) Compute the one-sided $(1-\alpha)$ upper confidence limit on the mean as:

$$UCL_{1-\alpha} = \bar{x} - W(Q_\alpha)s\,.$$

In calculating Hall's bootstrap, five replicate calculations of the 10,000 resample sets each were generated, and the median UCL value used. These replicates were used to determine whether or not each given data set was sensitive to small differences with the random re-sampling algorithm used during calculations.

3.8 LAND'S-H UCL

Land's-H UCL is calculated as follows:

Step 1) Compute the arithmetic mean $\bar{x}_{\log}$ of the natural log-transformed data.

Step 2) Compute the standard deviation $s_{\log}$ of the natural log-transformed data.

Step 3) Look up the $H_{1-\alpha}$ statistic from Table 8.

Step 4) Compute the one-sided $(1-\alpha)$ upper confidence limit on the mean as:

$$UCL_{1-\alpha} = e^{\left(\bar{x}_{\log} + \frac{s^2_{\log}}{2} + \frac{H_{1-\alpha} s_{\log}}{\sqrt{n-1}}\right)}$$

where *n* is the number of samples.

3.9 UCLs BASED ON THE CHEBYSHEV INEQUALITY

3.9.1 CHEBYSHEV UCLs BASED ON SAMPLE MEAN AND STANDARD DEVIATION (DETECTED DATA)

Non-parametric (rank-based) UCLs for data sets containing no non-detect data are calculated using the Chebyshev inequality as follows:

Step 1) Compute the sample mean $(\bar{x})$ and standard deviation (*s*).

Step 2) Calculate the one-sided (1 - α) upper confidence limit of the mean as:

$$\text{UCL} = \bar{x} + \sqrt{\left((1/\alpha)-1\right)}\, s/\sqrt{n}$$

Where *n* is the number of samples and α=0.05 for a one-sided 95 percent UCL.

3.9.2 CHEBYSHEV UCLs BASED ON SAMPLE MEAN AND STANDARD DEVIATION (DATA SETS CONTAINING NON-DETECTS)

When non-detect data area present, the non-parametric Chebyshev 95 percent UCL is obtained by first finding estimates of the population mean $(\hat{\mu})$ and its standard error $(\hat{\sigma}_{SE})$ using the Kaplan-Meier procedure (see Section 3.3 above). These values are used in place of the sample mean $(\bar{x})$ and standard deviation (*s*) in the equation above, as shown below.

$$\text{UCL} = \hat{\mu} + \sqrt{\left((1/\alpha)-1\right)}\, \hat{\sigma}_{SE}/\sqrt{n}$$

3.10 PERCENTILE BOOTSTRAP UCLs (DATA SETS CONTAINING NON-DETECTS)

To calculate the 95 percent UCL using the Percentile Bootstrap method, the following steps are followed:

Step 1) Re-sample the original data a very large number of times (thousands of resamples were used for EPC calculations) using a sample size equal to the original number of samples, and calculate each resample set's estimated population mean ($\hat{\mu}_b$) using the KM method (see Section 3.3).

Step 2) Sort the $\hat{\mu}_b$ values from the lowest to the highest.

Step 3) Select the Percentile Bootstrap 95 percent UCL as:

$$95\%\ \text{UCL} = \hat{\mu}_{(0.95 \cdot N)}$$

where:

$\hat{\mu}_{(0.95 \cdot N)}$ = is the 0.95xNth ordered estimate of $\hat{\mu}_b$ out of N bootstrap sets

For example, when N = 1000, a percentile bootstrap 95%UCL (e.g., based upon KM method) is given by the 950th ordered bootstrap estimate of $\hat{\mu}_b$.

3.11 BIAS-CORRECTED ACCELERATED (BCA) BOOTSTRAP UCLs (DATA SETS CONTAINING NON-DETECTS)

To calculate the UCL based using the Bias-Corrected Accelerated (BCA) Percentile Bootstrap procedure, the following steps are required:

Step 1) Re-sample the original data a very large number of times (thousands of resamples were used for EPC calculations) using a sample size equal to the original number of samples and calculate each resample set's estimated population mean ($\hat{\mu}_b$) using the KM method (see Section 3.3).

Step 2) Sort the $\hat{\mu}_b$ values from the lowest to the highest.

Step 3) Determine the number overall average ($\bar{x}$) of the *N* resample population mean estimates $\hat{\mu}_b$.

Step 4) Determine the bias correction ($\hat{z}_0$) as:

$$\hat{z}_0 = \Phi^{-1}\left[\frac{\#\left(\hat{\mu}_b < \bar{x}\right)}{N}\right] \quad ; i = 1,2,\ldots,N$$

where:

$\#\left(\hat{\mu}_b < \bar{x}\right)$ = the number of times the bootstrap mean is below the overall average

Φ^{-1} = the inverse of the standard normal cumulative distribution (from a *z*-score table, e.g., Table 9)

Step 5) Determine the acceleration factor ($\hat{\alpha}$) as:

$$\hat{\alpha} = \frac{\sum\left(\bar{x} - \bar{x}_{-i}\right)^3}{6 \cdot \left[\sum\left(\bar{x} - \bar{x}_{-i}\right)^2\right]^{1.5}}$$

where:

$\bar{x}_{-i}$ = the mean of the Kaplan-Meier population means ($\hat{\mu}_b$) for all resample sets excluding the i^{th} bootstrap set

Step 6) Determine BCA order percentile α_2 as:

$$\alpha_2 = \Phi\left[\hat{z}_0 + \frac{\hat{z}_0 + z^{1-\alpha}}{1 - \hat{\alpha}\left(\hat{z}_0 + z^{1-\alpha}\right)}\right]$$

where:

Φ = the standard normal cumulative distribution (*z*-score) for the value in square parentheses

$z^{1-\alpha}$ = the 100(1-α)th percentile of the standard normal distribution

$\alpha_2, \hat{z}_0, \hat{\alpha}$ = have been previously defined above

Step 7) Select the α_2 th percentile (i.e., α_2 x N^{th} value) of the ordered μ_b (from Step 2) as the 95 percent BCA Percentile Bootstrap UCL.

4.0 MAXIMUM DETECTED VALUE

USEPA (1992 and 2002) allow an optional use of the maximum observed concentrations for the EPC estimate in cases where the calculated UCL exceeds the maximum value. However, USEPA (2002) warns that this may not be appropriate for data sets with very small sample sizes, because the observed maximum may be below the population mean. USEPA (2007b) recommends against using the maximum observed concentration as the EPC value. For skewed data sets of small sample sizes ($n < 10$-20), the maximum concentration does not provide 95 percent coverage to the population mean, and for larger data sets, it overestimates the EPC value, potentially resulting in unnecessary remediation. Rather, where the UCL computed following the stated methods exceeds maximum value, USEPA (2009a,b) recommends the use of an alternative value based on the Chebyshev Inequality. The only exception to the noted is in cases in which all data are non-detects, in which case the maximum reporting limit may be used for the EPC.

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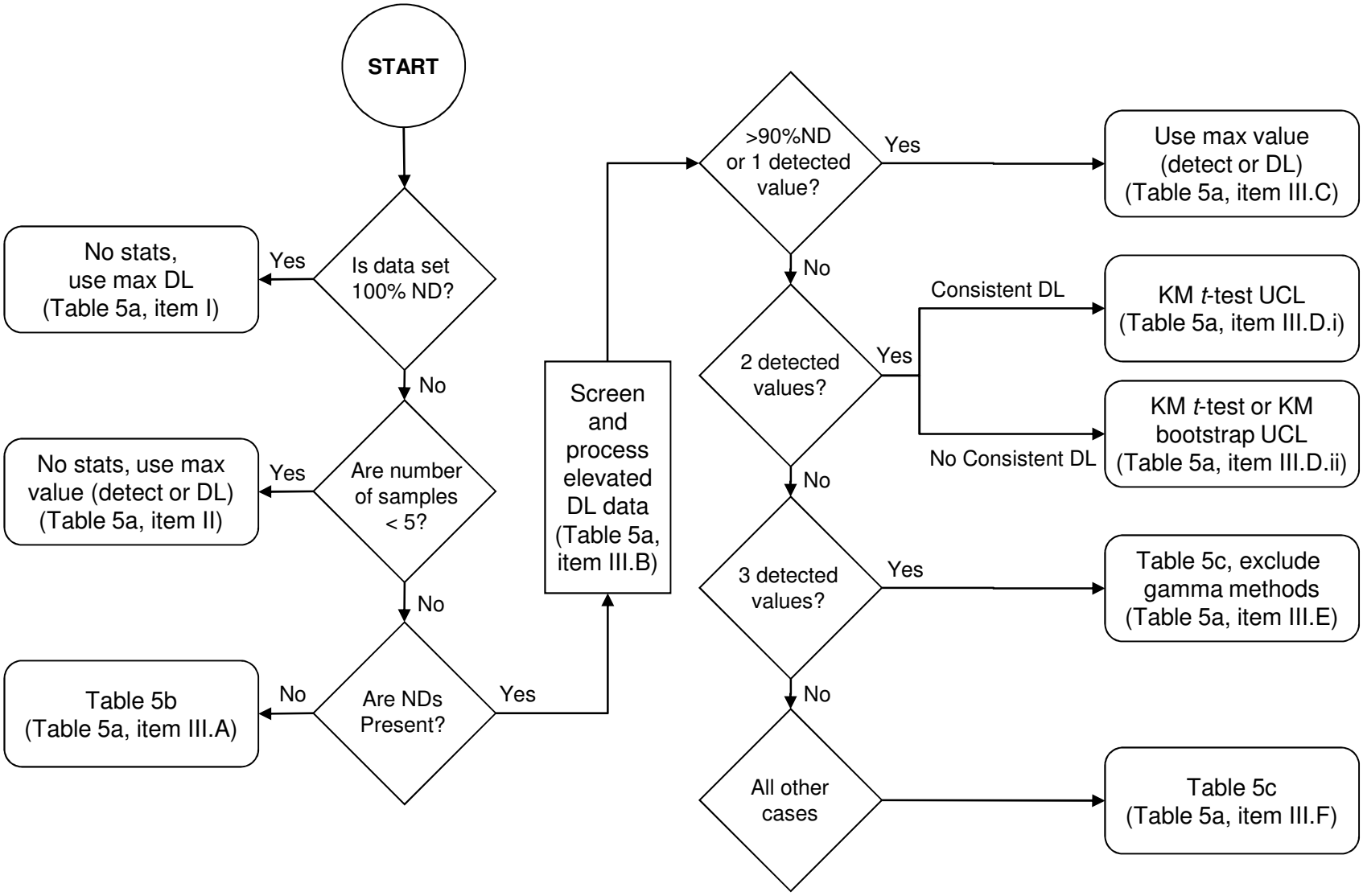

Notes:
ND = Non-detect
DL = Detection Limit

figure 1
UCL METHODS DECISION FLOWCHART

TABLE 1

COEFFICIENTS a_i FOR THE SHAPIRO-WILK W-TEST OF NORMALITY

Order	*Number of Samples (n)*																
Statistic (i)	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
1	0.7071	0.7071	0.6872	0.6646	0.6431	0.6233	0.6052	0.5888	0.5739	0.5601	0.5475	0.5359	0.5251	0.5150	0.5056	0.4968	0.4886
2	---	0.0000	0.1677	0.2413	0.2806	0.3031	0.3164	0.3244	0.3291	0.3315	0.3325	0.3325	0.3318	0.3306	0.3290	0.3273	0.3253
3	---	---	---	0.0000	0.0875	0.1401	0.1743	0.1976	0.2141	0.2260	0.2347	0.2412	0.2460	0.2495	0.2521	0.2540	0.2553
4	---	---	---	---	---	0.0000	0.0561	0.0947	0.1224	0.1429	0.1586	0.1707	0.1802	0.1878	0.1939	0.1988	0.2027
5	---	---	---	---	---	---	---	0.0000	0.0399	0.0695	0.0922	0.1099	0.1240	0.1353	0.1447	0.1524	0.1587
6	---	---	---	---	---	---	---	---	---	0.0000	0.0303	0.0539	0.0727	0.0880	0.1005	0.1109	0.1197
7	---	---	---	---	---	---	---	---	---	---	---	0.0000	0.0240	0.0433	0.0593	0.0725	0.0837
8	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0000	0.0196	0.0359	0.0496
9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0000	0.0163
10	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
11	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
14	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
15	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
16	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
17	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
18	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
19	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
20	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
21	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
22	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
23	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
24	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
25	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

TABLE 1

COEFFICIENTS a_i FOR THE SHAPIRO-WILK W-TEST OF NORMALITY

Order	*Number of Samples (n)*															
Statistic (i)	***19***	***20***	***21***	***22***	***23***	***24***	***25***	***26***	***27***	***28***	***29***	***30***	***31***	***32***	***33***	***34***
1	0.4808	0.4734	0.4643	0.4590	0.4542	0.4493	0.4450	0.4407	0.4366	0.4328	0.4291	0.4254	0.4220	0.4188	0.4156	0.4127
2	0.3232	0.3211	0.3185	0.3156	0.3126	0.3098	0.3069	0.3043	0.3018	0.2992	0.2968	0.2944	0.2921	0.2898	0.2876	0.2854
3	0.2561	0.2565	0.2578	0.2571	0.2563	0.2554	0.2543	0.2533	0.2522	0.2510	0.2499	0.2487	0.2475	0.2463	0.2451	0.2439
4	0.2059	0.2085	0.2119	0.2131	0.2139	0.2145	0.2148	0.2151	0.2152	0.2151	0.2150	0.2148	0.2145	0.2141	0.2137	0.2132
5	0.1641	0.1686	0.1736	0.1764	0.1787	0.1807	0.1822	0.1836	0.1848	0.1857	0.1864	0.1870	0.1874	0.1878	0.1880	0.1882
6	0.1271	0.1334	0.1399	0.1443	0.1480	0.1512	0.1539	0.1563	0.1584	0.1601	0.1616	0.1630	0.1641	0.1651	0.1660	0.1667
7	0.0932	0.1013	0.1092	0.1150	0.1201	0.1245	0.1283	0.1316	0.1346	0.1372	0.1395	0.1415	0.1433	0.1449	0.1463	0.1475
8	0.0612	0.0711	0.0804	0.0878	0.0941	0.0997	0.1046	0.1089	0.1128	0.1162	0.1192	0.1219	0.1243	0.1265	0.1284	0.1301
9	0.0303	0.0422	0.0530	0.0618	0.0696	0.0764	0.0823	0.0876	0.0923	0.0965	0.1002	0.1036	0.1066	0.1093	0.1118	0.1140
10	0.0000	0.0140	0.0263	0.0368	0.0459	0.0539	0.0610	0.0672	0.0728	0.0778	0.0822	0.0862	0.0899	0.0931	0.0961	0.0988
11	---	---	0.0000	0.0122	0.0228	0.0321	0.0403	0.0476	0.0540	0.0598	0.0650	0.0697	0.0739	0.0777	0.0812	0.0844
12	---	---	---	---	0.0000	0.0107	0.0200	0.0284	0.0358	0.0424	0.0483	0.0537	0.0585	0.0629	0.0669	0.0706
13	---	---	---	---	---	---	0.0000	0.0094	0.0178	0.0253	0.0320	0.0381	0.0435	0.0485	0.0530	0.0572
14	---	---	---	---	---	---	---	---	0.0000	0.0084	0.0159	0.0227	0.0289	0.0344	0.0395	0.0441
15	---	---	---	---	---	---	---	---	---	---	0.0000	0.0076	0.0144	0.0206	0.0262	0.0314
16	---	---	---	---	---	---	---	---	---	---	---	---	0.0000	0.0068	0.0131	0.0187
17	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0000	0.0062
18	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
19	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
20	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
21	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
22	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
23	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
24	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
25	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

TABLE 1

COEFFICIENTS a_i FOR THE SHAPIRO-WILK W-TEST OF NORMALITY

Order	*Number of Samples (n)*															
Statistic (i)	***35***	***36***	***37***	***38***	***39***	***40***	***41***	***42***	***43***	***44***	***45***	***46***	***47***	***48***	***49***	***50***
1	0.4096	0.4068	0.4040	0.4015	0.3989	0.3964	0.3940	0.3917	0.3894	0.3872	0.3850	0.3830	0.3808	0.3789	0.3770	0.3751
2	0.2834	0.2813	0.2794	0.2774	0.2755	0.2737	0.2719	0.2701	0.2684	0.2667	0.2651	0.2635	0.2620	0.2604	0.2589	0.2574
3	0.2427	0.2415	0.2403	0.2391	0.2380	0.2368	0.2357	0.2345	0.2334	0.2323	0.2313	0.2302	0.2291	0.2281	0.2271	0.2260
4	0.2127	0.2121	0.2116	0.2110	0.2104	0.2098	0.2091	0.2085	0.2078	0.2072	0.2065	0.2058	0.2052	0.2045	0.2038	0.2032
5	0.1883	0.1883	0.1883	0.1881	0.1880	0.1878	0.1876	0.1874	0.1871	0.1868	0.1865	0.1862	0.1859	0.1855	0.1851	0.1847
6	0.1673	0.1678	0.1683	0.1686	0.1689	0.1691	0.1693	0.1694	0.1695	0.1695	0.1695	0.1695	0.1695	0.1693	0.1692	0.1691
7	0.1487	0.1496	0.1505	0.1513	0.1520	0.1526	0.1531	0.1535	0.1539	0.1542	0.1545	0.1548	0.1550	0.1551	0.1553	0.1554
8	0.1317	0.1331	0.1344	0.1356	0.1366	0.1376	0.1384	0.1392	0.1398	0.1405	0.1410	0.1415	0.1420	0.1423	0.1427	0.1430
9	0.1160	0.1179	0.1196	0.1211	0.1225	0.1237	0.1249	0.1259	0.1269	0.1278	0.1286	0.1293	0.1300	0.1306	0.1312	0.1317
10	0.1013	0.1036	0.1056	0.1075	0.1092	0.1108	0.1123	0.1136	0.1149	0.1160	0.1170	0.1180	0.1189	0.1197	0.1205	0.1212
11	0.0873	0.0900	0.0924	0.0947	0.0967	0.0986	0.1004	0.1020	0.1035	0.1049	0.1062	0.1073	0.1085	0.1095	0.1105	0.1113
12	0.0739	0.0770	0.0798	0.0824	0.0848	0.0870	0.0891	0.0909	0.0927	0.0943	0.0959	0.0972	0.0986	0.0998	0.1010	0.1020
13	0.0610	0.0645	0.0677	0.0706	0.0733	0.0759	0.0782	0.0804	0.0824	0.0842	0.0860	0.0876	0.0892	0.0906	0.0919	0.0932
14	0.0484	0.0523	0.0559	0.0592	0.0622	0.0651	0.0677	0.0701	0.0724	0.0745	0.0765	0.0783	0.0801	0.0817	0.0832	0.0846
15	0.0361	0.0404	0.0444	0.0481	0.0515	0.0546	0.0575	0.0602	0.0628	0.0651	0.0673	0.0694	0.0713	0.0731	0.0748	0.0764
16	0.0239	0.0287	0.0331	0.0372	0.0409	0.0444	0.0476	0.0506	0.0534	0.0560	0.0584	0.0607	0.0628	0.0648	0.0667	0.0685
17	0.0119	0.0172	0.0220	0.0264	0.0305	0.0343	0.0379	0.0411	0.0442	0.0471	0.0497	0.0522	0.0546	0.0568	0.0588	0.0608
18	0.0000	0.0057	0.0110	0.0158	0.0203	0.0244	0.0283	0.0318	0.0352	0.0383	0.0412	0.0439	0.0465	0.0489	0.0511	0.0532
19	---	---	0.0000	0.0053	0.0101	0.0146	0.0188	0.0227	0.0263	0.0296	0.0328	0.0357	0.0385	0.0411	0.0436	0.0459
20	---	---	---	---	0.0000	0.0049	0.0094	0.0136	0.0175	0.0211	0.0245	0.0277	0.0307	0.0335	0.0361	0.0386
21	---	---	---	---	---	---	0.0000	0.0045	0.0087	0.0126	0.0163	0.0197	0.0229	0.0259	0.0288	0.0314
22	---	---	---	---	---	---	---	---	0.0000	0.0042	0.0081	0.0118	0.0153	0.0185	0.0215	0.0244
23	---	---	---	---	---	---	---	---	---	---	0.0000	0.0039	0.0076	0.0111	0.0143	0.0174
24	---	---	---	---	---	---	---	---	---	---	---	---	0.0000	0.0037	0.0071	0.0104
25	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0.0000	0.0035

TABLE 2

CRITICAL VALUES (W_{crit}) FOR THE SHAPIRO-WILK W-TEST OF NORMALITY

Number	***Selected Level of Significance (a)***								
of Samples	***0.01***	***0.02***	***0.05***	***0.10***	***0.50***	***0.90***	***0.95***	***0.98***	***0.99***
3	0.753	0.756	0.767	0.789	0.959	0.998	0.999	1.000	1.000
4	0.687	0.707	0.748	0.792	0.935	0.987	0.992	0.996	0.997
5	0.686	0.715	0.762	0.806	0.927	0.979	0.986	0.991	0.993
6	0.713	0.743	0.788	0.826	0.927	0.974	0.981	0.986	0.989
7	0.730	0.760	0.803	0.838	0.928	0.972	0.979	0.985	0.988
8	0.749	0.778	0.818	0.851	0.932	0.972	0.978	0.984	0.987
9	0.764	0.791	0.829	0.859	0.935	0.972	0.978	0.984	0.986
10	0.781	0.806	0.842	0.869	0.938	0.972	0.978	0.983	0.986
11	0.792	0.817	0.850	0.876	0.940	0.973	0.979	0.984	0.986
12	0.805	0.828	0.859	0.883	0.943	0.973	0.979	0.984	0.986
13	0.814	0.837	0.866	0.889	0.945	0.974	0.979	0.984	0.986
14	0.825	0.846	0.874	0.895	0.947	0.975	0.980	0.984	0.986
15	0.835	0.855	0.881	0.901	0.950	0.975	0.980	0.984	0.987
16	0.844	0.863	0.887	0.906	0.952	0.976	0.981	0.985	0.987
17	0.851	0.869	0.892	0.910	0.954	0.977	0.981	0.985	0.987
18	0.858	0.874	0.897	0.914	0.956	0.978	0.982	0.986	0.988
19	0.863	0.879	0.901	0.917	0.957	0.978	0.982	0.986	0.988
20	0.868	0.884	0.905	0.920	0.959	0.979	0.983	0.986	0.988
21	0.873	0.888	0.908	0.923	0.960	0.980	0.983	0.987	0.988
22	0.878	0.892	0.911	0.926	0.961	0.980	0.984	0.987	0.989
23	0.881	0.895	0.914	0.928	0.962	0.981	0.984	0.987	0.989
24	0.884	0.898	0.916	0.930	0.963	0.981	0.985	0.987	0.989
25	0.888	0.901	0.918	0.931	0.964	0.981	0.985	0.988	0.989
26	0.891	0.904	0.920	0.933	0.965	0.982	0.985	0.988	0.989
27	0.894	0.906	0.923	0.935	0.965	0.982	0.985	0.988	0.990
28	0.896	0.908	0.924	0.936	0.966	0.982	0.985	0.988	0.990
29	0.898	0.910	0.926	0.937	0.966	0.982	0.985	0.988	0.990
30	0.900	0.912	0.927	0.939	0.967	0.983	0.985	0.988	0.990
31	0.902	0.914	0.929	0.940	0.967	0.983	0.986	0.988	0.990
32	0.904	0.915	0.930	0.941	0.968	0.983	0.986	0.988	0.990
33	0.906	0.917	0.931	0.942	0.968	0.983	0.986	0.989	0.990
34	0.908	0.919	0.933	0.943	0.969	0.983	0.986	0.989	0.990
35	0.910	0.920	0.934	0.944	0.969	0.984	0.986	0.989	0.990
36	0.912	0.922	0.935	0.945	0.970	0.984	0.986	0.989	0.990
37	0.914	0.924	0.936	0.946	0.970	0.984	0.987	0.989	0.990
38	0.916	0.925	0.938	0.947	0.971	0.984	0.987	0.989	0.990
39	0.917	0.927	0.939	0.948	0.971	0.984	0.987	0.989	0.991
40	0.919	0.928	0.940	0.949	0.972	0.985	0.987	0.989	0.991
42	0.922	0.930	0.942	0.951	0.972	0.985	0.987	0.989	0.991
44	0.924	0.933	0.944	0.952	0.973	0.985	0.987	0.990	0.991
46	0.927	0.935	0.945	0.953	0.974	0.985	0.988	0.990	0.991
48	0.929	0.937	0.947	0.954	0.974	0.985	0.988	0.990	0.991
50	0.930	0.938	0.947	0.955	0.974	0.985	0.988	0.990	0.991

TABLE 3

CRITICAL VALUES (D_{crit}) FOR THE KOLMOGOROV SMIRNOV TEST OF GAMMA DISTRIBUTION ($\alpha = 0.05$)

	k (gamma parameter)								
n	***0.01***	***0.025***	***0.05***	***0.1***	***0.2***	***0.3***	***0.5***	***0.75***	***1***
4	0.4371	0.4323	0.4289	0.4296	0.4244	0.4181	0.4103	0.4050	0.4024
5	0.4191	0.4093	0.4009	0.3982	0.3885	0.3799	0.3716	0.3667	0.3644
6	0.3971	0.3844	0.3726	0.3688	0.3637	0.3568	0.3486	0.3434	0.3408
7	0.3849	0.3688	0.3528	0.3478	0.3419	0.3351	0.3272	0.3227	0.3196
8	0.3724	0.3541	0.3356	0.3287	0.3233	0.3170	0.3090	0.3041	0.3015
9	0.3617	0.3418	0.3208	0.3123	0.3075	0.3015	0.2941	0.2893	0.2869
10	0.3523	0.3314	0.3081	0.2984	0.2941	0.2878	0.2808	0.2760	0.2737
11	0.3440	0.3221	0.2976	0.2862	0.2819	0.2759	0.2691	0.2649	0.2624
12	0.3368	0.3137	0.2873	0.2753	0.2710	0.2653	0.2587	0.2548	0.2524
13	0.3297	0.3064	0.2789	0.2659	0.2613	0.2563	0.2498	0.2459	0.2430
14	0.3234	0.2996	0.2711	0.2568	0.2530	0.2478	0.2416	0.2376	0.2351
15	0.3178	0.2934	0.2638	0.2489	0.2451	0.2400	0.2338	0.2302	0.2279
16	0.3127	0.2878	0.2577	0.2419	0.2376	0.2329	0.2272	0.2232	0.2212
17	0.3078	0.2826	0.2519	0.2352	0.2315	0.2268	0.2209	0.2173	0.2151
18	0.3033	0.2776	0.2464	0.2292	0.2253	0.2208	0.2151	0.2114	0.2094
19	0.2990	0.2731	0.2415	0.2236	0.2198	0.2151	0.2100	0.2061	0.2043
20	0.2949	0.2691	0.2366	0.2185	0.2145	0.2101	0.2049	0.2014	0.1994
21	0.2915	0.2649	0.2323	0.2132	0.2097	0.2054	0.2004	0.1969	0.1949
22	0.2879	0.2612	0.2283	0.2090	0.2055	0.2011	0.1959	0.1927	0.1908
23	0.2847	0.2580	0.2247	0.2046	0.2013	0.1969	0.1919	0.1886	0.1867
24	0.2813	0.2546	0.2211	0.2007	0.1971	0.1932	0.1881	0.1849	0.1830
25	0.2786	0.2516	0.2179	0.1969	0.1933	0.1895	0.1845	0.1813	0.1796
26	0.2759	0.2486	0.2146	0.1933	0.1896	0.1858	0.1812	0.1780	0.1764
27	0.2732	0.2459	0.2118	0.1899	0.1863	0.1827	0.1779	0.1750	0.1730
28	0.2709	0.2434	0.2088	0.1867	0.1832	0.1795	0.1749	0.1719	0.1702
29	0.2683	0.2409	0.2062	0.1837	0.1802	0.1767	0.1721	0.1690	0.1675
30	0.2663	0.2386	0.2037	0.1809	0.1772	0.1736	0.1692	0.1663	0.1648
35	0.2561	0.2281	0.1927	0.1683	0.1647	0.1613	0.1571	0.1545	0.1530
40	0.2482	0.2196	0.1835	0.1581	0.1544	0.1514	0.1476	0.1449	0.1437
45	0.2412	0.2124	0.1759	0.1496	0.1461	0.1432	0.1393	0.1370	0.1356
50	0.2353	0.2063	0.1695	0.1425	0.1389	0.1361	0.1324	0.1304	0.1289
60	0.2258	0.1963	0.1592	0.1308	0.1272	0.1245	0.1214	0.1192	0.1180
70	0.2183	0.1886	0.1513	0.1216	0.1179	0.1157	0.1126	0.1107	0.1095
80	0.2122	0.1823	0.1447	0.1143	0.1105	0.1083	0.1055	0.1037	0.1027
90	0.2071	0.1771	0.1392	0.1082	0.1044	0.1023	0.0996	0.0979	0.0970
100	0.2029	0.1727	0.1347	0.1031	0.0991	0.0971	0.0946	0.0929	0.0921
200	0.1794	0.1487	0.1096	0.0753	0.0705	0.0691	0.0673	0.0662	0.0655
300	0.1691	0.1380	0.0985	0.0631	0.0577	0.0566	0.0551	0.0542	0.0537
400	0.1629	0.1316	0.0919	0.0559	0.0501	0.0491	0.0478	0.0470	0.0465
500	0.1587	0.1274	0.0874	0.0510	0.0448	0.0439	0.0428	0.0421	0.0417
1000	0.1484	0.1168	0.0764	0.0390	0.0318	0.0311	0.0303	0.0298	0.0295
2500	0.1394	0.1076	0.0668	0.0286	0.0202	0.0197	0.0192	0.0189	0.0187

Source: ProUCL Version 4.00.04 Technical Guide (February 2009)

TABLE 3

CRITICAL VALUES (D_{crit}) FOR THE KOLMOGOROV SMIRNOV TEST OF GAMMA DISTRIBUTION ($\alpha = 0.05$)

	k (gamma parameter)								
n	***1.5***	***2***	***3***	***4***	***5***	***10***	***20***	***50***	***100***
4	0.3995	0.3979	0.3966	0.3962	0.3959	0.3949	0.3942	0.3938	0.3940
5	0.3617	0.3605	0.3594	0.3584	0.3583	0.3576	0.3572	0.3569	0.3568
6	0.3375	0.3358	0.3346	0.3335	0.3328	0.3325	0.3317	0.3318	0.3315
7	0.3170	0.3151	0.3137	0.3129	0.3130	0.3119	0.3115	0.3114	0.3113
8	0.2989	0.2975	0.2963	0.2953	0.2952	0.2943	0.2939	0.2934	0.2936
9	0.2840	0.2825	0.2813	0.2804	0.2798	0.2793	0.2788	0.2787	0.2788
10	0.2711	0.2698	0.2685	0.2678	0.2674	0.2666	0.2662	0.2659	0.2658
11	0.2597	0.2585	0.2570	0.2565	0.2560	0.2554	0.2550	0.2546	0.2544
12	0.2495	0.2485	0.2474	0.2464	0.2459	0.2454	0.2452	0.2450	0.2450
13	0.2409	0.2394	0.2382	0.2377	0.2374	0.2367	0.2361	0.2362	0.2360
14	0.2327	0.2316	0.2305	0.2298	0.2293	0.2287	0.2283	0.2280	0.2279
15	0.2255	0.2244	0.2233	0.2226	0.2221	0.2215	0.2212	0.2210	0.2209
16	0.2189	0.2179	0.2167	0.2161	0.2158	0.2152	0.2146	0.2144	0.2144
17	0.2129	0.2117	0.2106	0.2100	0.2097	0.2089	0.2087	0.2085	0.2084
18	0.2072	0.2063	0.2050	0.2046	0.2041	0.2034	0.2033	0.2031	0.2031
19	0.2021	0.2008	0.2000	0.1992	0.1990	0.1986	0.1981	0.1981	0.1979
20	0.1974	0.1961	0.1950	0.1946	0.1945	0.1938	0.1935	0.1934	0.1934
21	0.1928	0.1918	0.1909	0.1903	0.1900	0.1894	0.1892	0.1889	0.1889
22	0.1885	0.1879	0.1867	0.1862	0.1859	0.1853	0.1849	0.1851	0.1848
23	0.1849	0.1838	0.1827	0.1824	0.1821	0.1815	0.1810	0.1809	0.1809
24	0.1812	0.1802	0.1792	0.1787	0.1783	0.1777	0.1775	0.1774	0.1772
25	0.1777	0.1767	0.1759	0.1753	0.1749	0.1745	0.1742	0.1739	0.1739
26	0.1742	0.1734	0.1724	0.1719	0.1716	0.1712	0.1708	0.1707	0.1707
27	0.1714	0.1705	0.1694	0.1689	0.1686	0.1681	0.1678	0.1676	0.1677
28	0.1684	0.1676	0.1666	0.1661	0.1659	0.1652	0.1652	0.1649	0.1648
29	0.1655	0.1647	0.1639	0.1634	0.1630	0.1625	0.1623	0.1622	0.1620
30	0.1629	0.1621	0.1611	0.1607	0.1603	0.1600	0.1597	0.1595	0.1596
35	0.1515	0.1507	0.1497	0.1494	0.1490	0.1486	0.1484	0.1482	0.1481
40	0.1420	0.1412	0.1404	0.1401	0.1399	0.1394	0.1391	0.1390	0.1390
45	0.1342	0.1334	0.1327	0.1323	0.1322	0.1317	0.1315	0.1314	0.1313
50	0.1275	0.1269	0.1262	0.1257	0.1256	0.1252	0.1249	0.1249	0.1249
60	0.1168	0.1161	0.1156	0.1151	0.1150	0.1147	0.1144	0.1143	0.1143
70	0.1084	0.1078	0.1071	0.1069	0.1067	0.1064	0.1061	0.1061	0.1061
80	0.1016	0.1011	0.1005	0.1002	0.0999	0.0997	0.0995	0.0993	0.0994
90	0.0959	0.0954	0.0949	0.0945	0.0944	0.0941	0.0939	0.0939	0.0938
100	0.0911	0.0906	0.0901	0.0898	0.0896	0.0894	0.0892	0.0892	0.0892
200	0.0648	0.0645	0.0641	0.0639	0.0638	0.0635	0.0635	0.0635	0.0634
300	0.0531	0.0528	0.0524	0.0523	0.0522	0.0521	0.0520	0.0519	0.0520
400	0.0460	0.0457	0.0455	0.0454	0.0453	0.0452	0.0451	0.0451	0.0451
500	0.0412	0.0410	0.0408	0.0406	0.0406	0.0404	0.0404	0.0403	0.0404
1000	0.0292	0.0291	0.0289	0.0288	0.0288	0.0286	0.0286	0.0286	0.0286
2500	0.0185	0.0184	0.0183	0.0183	0.0182	0.0182	0.0181	0.0181	0.0181

Source: ProUCL Version 4.00.04 Technical Guide (February 2009)

TABLE 4

CRITICAL VALUES (A^2_{crit}) FOR THE ANDERSON-DARLING TEST OF GAMMA DISTRIBUTION (α = 0.05)

	k (gamma parameter)								
n	***0.01***	***0.025***	***0.05***	***0.1***	***0.2***	***0.3***	***0.5***	***0.75***	***1***
4	0.7933	0.7883	0.7863	0.7785	0.7325	0.7041	0.6809	0.6703	0.6666
5	0.8730	0.8462	0.8304	0.8264	0.7753	0.7392	0.7110	0.6983	0.6913
6	0.9490	0.8965	0.8535	0.8446	0.8025	0.7667	0.7359	0.7210	0.7151
7	1.0305	0.9476	0.8762	0.8598	0.8211	0.7841	0.7515	0.7361	0.7275
8	1.1136	1.0006	0.8986	0.8720	0.8359	0.7973	0.7624	0.7451	0.7355
9	1.1971	1.0535	0.9227	0.8810	0.8451	0.8073	0.7707	0.7515	0.7435
10	1.2792	1.1063	0.9420	0.8881	0.8539	0.8136	0.7770	0.7570	0.7483
11	1.3623	1.1586	0.9637	0.8950	0.8601	0.8201	0.7811	0.7625	0.7516
12	1.4414	1.2089	0.9834	0.8989	0.8656	0.8239	0.7849	0.7656	0.7567
13	1.5200	1.2605	1.0039	0.9049	0.8682	0.8298	0.7900	0.7703	0.7574
14	1.5958	1.3106	1.0234	0.9072	0.8735	0.8320	0.7933	0.7706	0.7600
15	1.6732	1.3605	1.0405	0.9113	0.8768	0.8355	0.7930	0.7751	0.7630
16	1.7482	1.4088	1.0618	0.9164	0.8783	0.8378	0.7963	0.7745	0.7633
17	1.8194	1.4552	1.0796	0.9205	0.8827	0.8418	0.7979	0.7764	0.7660
18	1.8905	1.4995	1.0965	0.9229	0.8842	0.8421	0.8001	0.7780	0.7666
19	1.9614	1.5452	1.1162	0.9250	0.8877	0.8428	0.8028	0.7788	0.7692
20	2.0284	1.5917	1.1322	0.9289	0.8880	0.8447	0.8025	0.7795	0.7679
21	2.0984	1.6336	1.1480	0.9288	0.8903	0.8458	0.8053	0.7828	0.7696
22	2.1639	1.6751	1.1669	0.9334	0.8918	0.8476	0.8043	0.7830	0.7708
23	2.2329	1.7214	1.1839	0.9338	0.8939	0.8488	0.8051	0.7822	0.7693
24	2.2974	1.7630	1.2009	0.9377	0.8938	0.8512	0.8063	0.7825	0.7719
25	2.3601	1.8028	1.2161	0.9394	0.8955	0.8518	0.8069	0.7835	0.7731
26	2.4252	1.8483	1.2315	0.9393	0.8936	0.8516	0.8085	0.7842	0.7734
27	2.4909	1.8820	1.2531	0.9437	0.8957	0.8531	0.8074	0.7839	0.7733
28	2.5562	1.9280	1.2634	0.9432	0.8971	0.8543	0.8103	0.7847	0.7738
29	2.6160	1.9685	1.2809	0.9478	0.8976	0.8562	0.8115	0.7837	0.7742
30	2.6778	2.0063	1.2983	0.9482	0.8976	0.8538	0.8092	0.7878	0.7755
35	2.9819	2.1959	1.3736	0.9546	0.8995	0.8565	0.8122	0.7877	0.7757
40	3.2742	2.3805	1.4435	0.9625	0.9028	0.8577	0.8131	0.7891	0.7787
45	3.5595	2.5587	1.5106	0.9690	0.9054	0.8619	0.8134	0.7897	0.7769
50	3.8334	2.7329	1.5791	0.9737	0.9074	0.8624	0.8143	0.7934	0.7800
60	4.3789	3.0659	1.7118	0.9844	0.9099	0.8633	0.8160	0.7921	0.7791
70	4.9012	3.3923	1.8398	0.9917	0.9096	0.8657	0.8167	0.7926	0.7805
80	5.4154	3.7091	1.9620	1.0021	0.9104	0.8649	0.8189	0.7931	0.7820
90	5.9167	4.0188	2.0787	1.0111	0.9113	0.8679	0.8184	0.7936	0.7828
100	6.4255	4.3222	2.1954	1.0194	0.9123	0.8676	0.8184	0.7950	0.7830
200	11.1598	7.1943	3.2677	1.1031	0.9142	0.8692	0.8209	0.7962	0.7839
300	15.6877	9.9089	4.2544	1.1798	0.9166	0.8707	0.8217	0.7969	0.7840
400	20.0982	12.5299	5.1940	1.2564	0.9170	0.8713	0.8230	0.7977	0.7846
500	24.4270	15.1069	6.1097	1.3280	0.9178	0.8716	0.8223	0.7971	0.7851
1000	45.5811	27.5755	10.4679	1.6707	0.9188	0.8707	0.8244	0.7966	0.7846
2500	107.0180	63.4597	22.7439	2.5739	0.9200	0.8732	0.8223	0.7969	0.7860

Source: ProUCL Version 4.00.04 Technical Guide (February 2009)

TABLE 4

CRITICAL VALUES (A^2_{crit}) FOR THE ANDERSON-DARLING TEST OF GAMMA DISTRIBUTION (α = 0.05)

	k (gamma parameter)								
n	***1.5***	***2***	***3***	***4***	***5***	***10***	***20***	***50***	***100***
4	0.6624	0.6605	0.6594	0.6589	0.6590	0.6571	0.6571	0.6559	0.6565
5	0.6864	0.6845	0.6826	0.6812	0.6807	0.6789	0.6787	0.6783	0.6781
6	0.7078	0.7042	0.7013	0.7000	0.6980	0.6983	0.6971	0.6969	0.6962
7	0.7212	0.7149	0.7122	0.7097	0.7099	0.7085	0.7067	0.7077	0.7077
8	0.7284	0.7240	0.7215	0.7186	0.7191	0.7150	0.7162	0.7148	0.7147
9	0.7344	0.7298	0.7268	0.7250	0.7228	0.7218	0.7210	0.7205	0.7200
10	0.7392	0.7356	0.7322	0.7294	0.7295	0.7251	0.7246	0.7244	0.7238
11	0.7422	0.7389	0.7335	0.7326	0.7314	0.7294	0.7287	0.7284	0.7257
12	0.7455	0.7415	0.7390	0.7358	0.7320	0.7303	0.7319	0.7296	0.7312
13	0.7503	0.7431	0.7392	0.7372	0.7359	0.7337	0.7333	0.7325	0.7323
14	0.7507	0.7459	0.7425	0.7401	0.7380	0.7345	0.7340	0.7330	0.7334
15	0.7538	0.7468	0.7445	0.7400	0.7386	0.7374	0.7347	0.7345	0.7341
16	0.7547	0.7503	0.7443	0.7419	0.7413	0.7390	0.7365	0.7354	0.7360
17	0.7557	0.7494	0.7454	0.7428	0.7416	0.7388	0.7378	0.7367	0.7362
18	0.7562	0.7526	0.7458	0.7426	0.7430	0.7392	0.7395	0.7383	0.7372
19	0.7569	0.7518	0.7481	0.7451	0.7424	0.7412	0.7403	0.7404	0.7379
20	0.7578	0.7524	0.7475	0.7455	0.7452	0.7418	0.7407	0.7394	0.7405
21	0.7582	0.7538	0.7494	0.7473	0.7453	0.7426	0.7425	0.7412	0.7395
22	0.7587	0.7561	0.7494	0.7466	0.7464	0.7436	0.7403	0.7429	0.7406
23	0.7601	0.7547	0.7503	0.7491	0.7465	0.7441	0.7419	0.7414	0.7404
24	0.7615	0.7551	0.7511	0.7487	0.7462	0.7443	0.7423	0.7421	0.7418
25	0.7615	0.7565	0.7513	0.7487	0.7470	0.7448	0.7432	0.7423	0.7418
26	0.7616	0.7573	0.7505	0.7478	0.7463	0.7441	0.7438	0.7428	0.7422
27	0.7630	0.7566	0.7517	0.7490	0.7474	0.7436	0.7440	0.7433	0.7439
28	0.7627	0.7580	0.7537	0.7497	0.7485	0.7453	0.7446	0.7431	0.7431
29	0.7627	0.7573	0.7527	0.7503	0.7475	0.7457	0.7442	0.7439	0.7423
30	0.7630	0.7585	0.7524	0.7495	0.7465	0.7455	0.7443	0.7441	0.7451
35	0.7666	0.7597	0.7537	0.7526	0.7497	0.7483	0.7467	0.7447	0.7459
40	0.7658	0.7590	0.7547	0.7525	0.7515	0.7480	0.7467	0.7458	0.7468
45	0.7679	0.7605	0.7556	0.7529	0.7532	0.7484	0.7482	0.7473	0.7471
50	0.7672	0.7629	0.7569	0.7535	0.7537	0.7496	0.7482	0.7476	0.7481
60	0.7689	0.7629	0.7580	0.7536	0.7533	0.7512	0.7489	0.7476	0.7484
70	0.7689	0.7634	0.7575	0.7557	0.7542	0.7507	0.7492	0.7486	0.7490
80	0.7703	0.7631	0.7589	0.7563	0.7545	0.7505	0.7508	0.7484	0.7488
90	0.7715	0.7651	0.7592	0.7554	0.7548	0.7521	0.7495	0.7513	0.7502
100	0.7698	0.7650	0.7585	0.7564	0.7543	0.7522	0.7495	0.7504	0.7500
200	0.7713	0.7664	0.7604	0.7564	0.7561	0.7512	0.7513	0.7503	0.7506
300	0.7720	0.7659	0.7594	0.7588	0.7568	0.7552	0.7509	0.7516	0.7523
400	0.7728	0.7660	0.7602	0.7586	0.7572	0.7542	0.7515	0.7523	0.7511
500	0.7721	0.7671	0.7615	0.7590	0.7563	0.7534	0.7522	0.7515	0.7530
1000	0.7713	0.7679	0.7603	0.7597	0.7573	0.7527	0.7519	0.7497	0.7520
2500	0.7722	0.7666	0.7603	0.7641	0.7572	0.7527	0.7513	0.7522	0.7525

Source: ProUCL Version 4.00.04 Technical Guide (February 2009)

TABLE 5a

INITIAL SCREENING FOR SMALL OR HIGHLY CENSORED DATA SETS, AND TREATMENT OF ELEVATED DETECTION LIMITS

I) Data Sets Containing No Detected Values (i.e., 100% ND)

In this case, no statistics are performed and the maximum reported detection limit is taken as the 95% UCL.

II) Data Sets Containing Fewer than Five Data Points (i.e., n < 5)

In this case, no statistics are performed and the maximum value (detect or reported detection limit) is taken as the 95% UCL.

III) All Other Data Sets (i.e., n ≥ 5 and at least 1 detected value)

A) If all data are detects (i.e., no non-detects present in the data set), then
proceed to Table 5b for UCL method selection

B) If non-detects are present, first screen and pre-process elevated detection limit data (i.e., above most or all detected values)

(i) If n ≤ 10,
no pre-processing occurs [continue to (C) below]

(ii) If 10 < n < 100, and fewer than 25 percent of all observations are non-detects with elevated detection limits,
remove the data with elevated detection limits from further consideration [and continue to (C) below]

(iii) If n ≥ 100, and fewer than 50 percent of all observations are non-detects with elevated detection limits,
remove the data with elevated detection limits from further consideration [and continue to (C) below]

(iv) Otherwise,
retain all data and continue to (C) below.

C) For highly-censored data sets (> 90% ND and/or containing only 1 detected value),
use the maximum value (detect or detection limit, ignoring any data eliminated in (A) above) as the 95% UCL

D) For censored data sets containing only 2 detected values,

(i) If all non-detects have a consistent (i.e., equal) detection limit), then
use the KM (*t*-test) 95% UCL

(ii) If non-detects have varying detection limits, then
use the KM (*t*-test) or KM (Percentile bootstrap) 95% UCL

E) For censored data sets containing only 3 detected values,
follow the methods presented in Table 5c for UCL method selection, *excluding gamma* distribution methods.

F) For all other cases (i.e., data sets with non-detects having four or more detected values),
proceed to Table 5c for UCL method selection

Notes:

UCL methods are consistent with the ProUCL Version 4.00.04 Technical Guide (USEPA 2009) and its precursor document (USEPA 2007), applying professional judgment where "policy decisions" are required to establish exposure point concentrations using small or highly-censored data sets.

% ND Percentage of non-detect (less than) results in a data set.

KM Kaplan-Meier (KM) estimation method used to determine the sample mean, its standard error, and the 95% UCL of the population mean for data sets containing non-detects.

TABLE 5b

STATISTICAL METHODS USED FOR DETERMINING 95 PERCENT UPPER CONFIDENCE LIMITS (UCLs) FOR DATA SETS WITHOUT NONDETECT OBSERVATIONS

I) Normal or Approximately Normal ($\hat{s}$< 0.5, k_3 < 0.2-0.3) Data Sets

Measure of Symmetry	*Sample Size*	*95 percent UCL Method*
Normal distribution	All $n \geq 5$	*t* -test UCL or Modified *t* -test UCL
$\hat{s} < 0.5$	All $n \geq 5$	*t* -test UCL or Modified *t* -test UCL
$k_3 < 0.2\text{-}0.3$	All $n \geq 5$	*t* -test UCL or Modified *t* -test UCL

II) Gamma Distributed Data Sets

Measure of Symmetry	*Sample Size*	*95 percent UCL Method*
$\kappa < 0.1$	$5 \leq n < 15$	Bootstrap-*t* or Hall's Bootstrap UCL (if stable)‡, otherwise Adjusted Gamma 95% UCL
	$n \geq 15$	Adjusted Gamma 95% UCL (if available), otherwise Approximate Gamma 95% UCL
$0.1 \leq \kappa < 0.5$	All $n \geq 5$	Adjusted Gamma 95% UCL
$0.5 \leq \kappa$	All $n \geq 5$	Approximate Gamma 95% UCL

III) Lognormally Distributed Data Sets

Measure of Symmetry	*Sample Size*	*95 percent UCL Method*
$\hat{s} < 0.5$	All $n \geq 5$	*t* -test, Modified *t* -test or Land's-H 95% UCL
$0.5 \leq \hat{s} < 1.0$	All $n \geq 5$	Land's-H UCL
$1.0 \leq \hat{s} < 1.5$	$5 \leq n < 25$	95% Chebyshev (Mean, Sd) UCL
	$n \geq 25$	Land's-H UCL
$1.5 \leq \hat{s} < 2.0$	$5 \leq n < 20$	99% Chebyshev (Mean, Sd) UCL
	$20 \leq n < 50$	95% Chebyshev (Mean, Sd) UCL
	$n \geq 50$	Land's-H UCL
$2.0 \leq \hat{s} < 2.5$	$5 \leq n < 20$	99% Chebyshev (Mean, Sd) UCL
	$20 \leq n < 50$	97.5% Chebyshev (Mean, Sd) UCL
	$50 \leq n < 70$	95% Chebyshev (Mean, Sd) UCL
	$n \geq 70$	Land's-H UCL
$2.5 \leq \hat{s} < 3.0$	$5 \leq n < 30$	99% Chebyshev (Mean, Sd) UCL
	$30 \leq n < 70$	97.5% Chebyshev (Mean, Sd) UCL
	$70 \leq n < 100$	95% Chebyshev (Mean, Sd) UCL
	$n \geq 100$	Land's-H UCL
$3.0 \leq \hat{s} \leq 3.5$	$5 \leq n < 15$	Hall's Bootstrap (if stable)*, otherwise 99% Chebyshev (Mean, Sd) UCL
	$15 \leq n < 50$	99% Chebyshev (Mean, Sd) UCL
	$50 \leq n < 100$	97.5% Chebyshev (Mean, Sd) UCL
	$100 \leq n < 150$	95% Chebyshev (Mean, Sd) UCL
	$n \geq 150$	Land's-H UCL
$\hat{s} > 3.5$	$5 \leq n < 100$	Hall's Bootstrap (if stable)*, otherwise 99% Chebyshev (Mean, Sd) UCL
	$n \geq 100$	99% Chebyshev (Mean, Sd) UCL

TABLE 5b

STATISTICAL METHODS USED FOR DETERMINING 95 PERCENT UPPER CONFIDENCE LIMITS (UCLs) FOR DATA SETS WITHOUT NONDETECT OBSERVATIONS

IV) Data Sets Requiring Non-Parametric (Distribution-Free) Methods

Measure of Symmetry	*Sample Size*	*95 percent UCL Method*
$\hat{s} \leq 0.5$	All $n \geq 5$	*t*- test UCL or Modified *t* -test 95% UCL
$0.5 < \hat{s} \leq 1.0$	All $n \geq 5$	95% Chebyshev (Mean, Sd) UCL
$1.0 < \hat{s} \leq 2.0$	$5 \leq n < 50$	99% Chebyshev (Mean, Sd) UCL
	$n \geq 50$	97.5% Chebyshev (Mean, Sd) UCL
$2.0 < \hat{s} \leq 3.0$	$5 \leq n < 10$	Hall's Bootstrap (if stable)*, otherwise 99% Chebyshev (Mean, Sd) UCL
	$n \geq 10$	99% Chebyshev (Mean, Sd) UCL
$3.0 < \hat{s} \leq 3.5$	$5 \leq n < 30$	Hall's Bootstrap (if stable)*, otherwise 99% Chebyshev (Mean, Sd) UCL
	$n \geq 30$	99% Chebyshev (Mean, Sd) UCL
$\hat{s} > 3.5$	$5 \leq n < 100$	Hall's Bootstrap (if stable)*, otherwise 99% Chebyshev (Mean, Sd) UCL
	$n \geq 100$	99% Chebyshev (Mean, Sd) UCL

Notes:

UCL methods selected are from ProUCL Version 4.00.04 Draft Technical Guide (USEPA 2009) and the precursor document (USEPA 2007).

$\hat{s}$ Standard deviation of natural-log transformed data.

κ Gamma shape parameter.

k_3 Skewness of the original (untransformed) data.

‡ If Bootstrap-*t* and Hall's bootstrap yield inflated UCLs, then the adjusted gamma UCL may be used.

* If Hall's Bootstrap yields an unrealistically high UCL, then the Chebyshev UCL should be used.

In cases where two UCL methods are listed, the one producing the higher (more conservative) estimate has been retained for the purposes of exposure estimates

TABLE 5c

STATISTICAL METHODS USED FOR DETERMINING 95 PERCENT UPPER CONFIDENCE LIMITS (UCLs) FOR DATA SETS WITH NONDETECT OBSERVATIONS

I) Normal or Approximately Normal (ŝ< 0.5) Data Sets [1]

Measure of Symmetry [1]	*Percentage of Non-Detect Results*	*Sample Size*	*95 percent UCL Method*
Normal distribution	0 < %ND < 100	All $n \geq 5$	KM (*t* -test) or KM (Percentile Bootstrap) 95% UCL
ŝ < 0.5	0 < %ND < 100	All $n \geq 5$	KM (*t* -test) or KM (Percentile Bootstrap) 95% UCL

II) Gamma Distributed Data Sets [1]

Measure of Symmetry [1]	*Percentage of Non-Detect Results*	*Sample Size*	*95 percent UCL Method*
$\kappa \leq 1$	0 < %ND < 30	All $n \geq 5$	KM (Chebyshev) 95% UCL
	30 ≤ %ND < 50	All $n \geq 5$	KM (BCA Bootstrap) 95% UCL
	50 ≤ %ND < 100	All $n \geq 5$	KM (*t* -test) 95% UCL
$1 < \kappa \leq 2$	0 < %ND < 10	All $n \geq 5$	KM (Chebyshev) 95% UCL
	10 ≤ %ND < 25	All $n \geq 5$	KM (BCA Bootstrap) 95% UCL
	25 ≤ %ND < 40	All $n \geq 5$	KM (Percentile Bootstrap) 95% UCL
	40 ≤ %ND < 100	All $n \geq 5$	KM (*t* -test) 95% UCL
$\kappa > 2$	0 < %ND < 20	All $n \geq 5$	KM (BCA Bootstrap) 95% UCL
	20 ≤ %ND < 40	All $n \geq 5$	KM (Percentile Bootstrap) 95% UCL
	40 ≤ %ND < 100	All $n \geq 5$	KM (*t* -test) 95% UCL

III) Lognormally Distributed Data Sets [1]

Measure of Symmetry [1]	*Percentage of Non-Detect Results*	*Sample Size*	*95 percent UCL Method*
ŝ ≤ 1.0	0 < %ND ≤ 20	$5 \leq n \leq$ 50-70	KM (Chebyshev) 95% UCL
	0 < %ND ≤ 20	$n >$ 50-70	KM (BCA Bootstrap) 95% UCL
	20 < %ND < 40	All $n \geq 5$	KM (BCA Bootstrap) 95% UCL
	40 ≤ %ND < 100	All $n \geq 5$	KM (*t* -test) or KM (Percentile Bootstrap) 95% UCL
1.0 ≤ ŝ ≤ 1.5	0 < %ND ≤ 50	$5 \leq n <$40	KM (Chebyshev) 97.5% UCL
	0 < %ND ≤ 50	$n \geq$ 40	KM (Chebyshev) 95% UCL
	50 < %ND < 100	All $n \geq 5$	KM (BCA Bootstrap) 95% UCL
1.5 < ŝ ≤ 2.0	0 < %ND < 50	$5 \leq n <$40	KM (Chebyshev) 99% UCL
	0 < %ND < 50	$n \geq$ 40	KM (Chebyshev) 97.5% UCL
	50 ≤ %ND < 100	$5 \leq n \leq$ 40-50	KM (Chebyshev) 97.5% UCL
	50 ≤ %ND < 100	$n \geq$ 40-50	KM (Chebyshev) 95% UCL
ŝ > 2.0, 3.0	0 < %ND < 100	$5 \leq n \leq$ 50-60	KM (Chebyshev) 99% UCL
	0 < %ND < 100	$n \geq$ 60	KM (Chebyshev) 97.5% UCL

TABLE 5c

STATISTICAL METHODS USED FOR DETERMINING 95 PERCENT UPPER CONFIDENCE LIMITS (UCLs) FOR DATA SETS WITH NONDETECT OBSERVATIONS

IV) Data Sets Requiring Non-Parametric (Distribution-Free) Methods [(1)]

Measure of Symmetry [(1)]	*Percentage of Non-Detect Results*	*Sample Size*	*95 percent UCL Method*
$\hat{s} < 0.5$	0 < %ND < 100	All $n \geq 5$	KM (*t* -test) or KM (Percentile Bootstrap) 95% UCL
$0.5 \leq \hat{s} \leq 1.0$	0 < %ND ≤ 20	$5 \leq n \leq$ 50-70	KM (Chebyshev) 95% UCL
	0 < %ND ≤ 20	$n >$ 50-70	KM (BCA Bootstrap) 95% UCL
	20 < %ND < 40	All $n \geq 5$	KM (BCA Bootstrap) 95% UCL
	40 ≤ %ND < 100	All $n \geq 5$	KM (*t* -test) or KM (Percentile Bootstrap) 95% UCL
$1.0 < \hat{s} \leq 1.5$	0 < %ND ≤ 50	$5 \leq n <$ 40	KM (Chebyshev) 97.5% UCL
	0 < %ND ≤ 50	$n \geq$ 40	KM (Chebyshev) 95% UCL
	50 < %ND < 100	All $n \geq 5$	KM (BCA Bootstrap) 95% UCL
$1.5 < \hat{s} \leq 2.0$	0 < %ND < 50	$5 \leq n <$ 40	KM (Chebyshev) 99% UCL
	0 < %ND < 50	$n \geq$ 40	KM (Chebyshev) 97.5% UCL
	50 ≤ %ND < 100	$5 \leq n \leq$ 40-50	KM (Chebyshev) 97.5% UCL
	50 ≤ %ND < 100	$n \geq$ 40-50	KM (Chebyshev) 95% UCL
$\hat{s} > 2.0, 3.0$	0 < %ND < 100	$5 \leq n <$ 50-60	KM (Chebyshev) 99% UCL
	0 < %ND < 100	$n \geq$ 60	KM (Chebyshev) 97.5% UCL

Notes:

UCL methods selected are from Section 4.10 of ProUCL Version 4.00.04 Draft Technical Guide (USEPA 2009) and the precursor document (USEPA 2007).

$\hat{s}$ Standard deviation of natural-log transformed data based on detected values only.

κ Gamma shape parameter, based on detected values only.

% ND Percentage of non-detect (less than) results in a data set.

KM Kaplan-Meier (KM) estimation method used to determine the sample mean, its standard error, and the 95% UCL of the population mean for data sets containing non-detects.

(1) Data distribution and symmetry statistic estimates are based on detected values only.

In cases where two UCL methods are listed, the one producing the higher (more conservative) estimate has been retained for the purposes of exposure estimates

TABLE 6

VALUES OF THE CUMULATIVE CHI-SQUARE (X^2) DISTRIBUTION ($\alpha = 0.05$)

Degrees of Freedom	*Chi-square Value*	*Degrees of Freedom*	*Chi-square Value*	*Degrees of Freedom*	*Chi-square Value*	*Degrees of Freedom*	*Chi-square Value*
1	0.003932	**42**	28.14	**155**	127.2	**410**	364.1
2	0.1026	**44**	29.79	**160**	131.8	**420**	373.5
3	0.3518	**46**	31.44	**165**	136.3	**430**	382.9
4	0.7107	**48**	33.10	**170**	140.8	**440**	392.4
5	1.145	**50**	34.76	**175**	145.4	**450**	401.8
6	1.635	**52**	36.44	**180**	150.0	**460**	411.3
7	2.167	**54**	38.12	**185**	154.5	**470**	420.7
8	2.733	**56**	39.80	**190**	159.1	**480**	430.2
9	3.325	**58**	41.49	**195**	163.7	**490**	439.7
10	3.940	**60**	43.19	**200**	168.3	**500**	449.1
11	4.575	**62**	44.89	**205**	172.9	**510**	458.6
12	5.226	**64**	46.59	**210**	177.5	**520**	468.1
13	5.892	**66**	48.31	**215**	182.1	**530**	477.6
14	6.571	**68**	50.02	**220**	186.7	**540**	487.1
15	7.261	**70**	51.74	**225**	191.3	**550**	496.6
16	7.962	**72**	53.46	**230**	195.9	**560**	506.1
17	8.672	**74**	55.19	**235**	200.5	**570**	515.6
18	9.390	**76**	56.92	**240**	205.1	**580**	525.1
19	10.12	**78**	58.65	**245**	209.8	**590**	534.7
20	10.85	**80**	60.39	**250**	214.4	**600**	544.2
21	11.59	**82**	62.13	**255**	219.0	**620**	563.2
22	12.34	**84**	63.88	**260**	223.7	**640**	582.3
23	13.09	**86**	65.62	**265**	228.3	**660**	601.4
24	13.85	**88**	67.37	**270**	232.9	**680**	620.5
25	14.61	**90**	69.13	**275**	237.6	**700**	639.6
26	15.38	**92**	70.88	**280**	242.2	**720**	658.7
27	16.15	**94**	72.64	**285**	246.9	**740**	677.9
28	16.93	**96**	74.40	**290**	251.6	**760**	697.0
29	17.71	**98**	76.16	**295**	256.2	**780**	716.2
30	18.49	**100**	77.93	**300**	260.9	**800**	735.4
31	19.28	**105**	82.35	**310**	270.2	**820**	754.5
32	20.07	**110**	86.79	**320**	279.6	**840**	773.7
33	20.87	**115**	91.24	**330**	288.9	**860**	792.9
34	21.66	**120**	95.70	**340**	298.3	**880**	812.2
35	22.47	**125**	100.2	**350**	307.6	**900**	831.4
36	23.27	**130**	104.7	**360**	317.0	**920**	850.6
37	24.07	**135**	109.2	**370**	326.4	**940**	869.8
38	24.88	**140**	113.7	**380**	335.8	**960**	889.1
39	25.70	**145**	118.2	**390**	345.2	**980**	908.3
40	26.51	**150**	122.7	**400**	354.6	**1000**	927.6

Source: MS Excel GammaInv function (setting 'probability'= 0.05, 'alpha' = degrees of freedom ÷ 2, and 'beta' = 2)

TABLE 7

ADJUSTED SIGNIFICANCE LEVELS (α') FOR ADJUSTED GAMMA UCL CALCULATIONS

Number	*Specified level of significance (a)*		
of Samples	***0.05***	***0.1***	***0.01***
5	0.0086	0.0432	0.0000
10	0.0267	0.0724	0.0015
20	0.0380	0.0866	0.0046
40	0.0440	0.0934	0.0070
∞	0.0500	0.1000	0.0100

Source: Table 2-2 of ProUCL Version 4.00.04 Technical Guide (February 2009)

TABLE 8

VALUES OF $H_{0.95}$ FOR LAND'S-H UCL METHOD

Standard deviation of log-transformed data (S_{log})	*Number of Samples*												
	3	***5***	***7***	***10***	***12***	***15***	***21***	***31***	***51***	***101***	***301***	***601***	***1001***
0.10	2.750	2.035	1.886	1.802	1.775	1.749	1.722	1.701	1.684	1.670	1.659	1.656	1.654
0.20	3.295	2.198	1.992	1.881	1.843	1.809	1.771	1.742	1.718	1.697	1.680	1.674	1.671
0.30	4.109	2.402	2.125	1.977	1.927	1.882	1.833	1.793	1.761	1.733	1.709	1.700	1.696
0.40	5.220	2.651	2.282	2.089	2.026	1.968	1.905	1.856	1.813	1.777	1.746	1.734	1.728
0.50	6.495	2.947	2.465	2.220	2.141	2.068	1.989	1.928	1.876	1.830	1.790	1.776	1.769
0.60	7.807	3.287	2.673	2.368	2.271	2.181	2.085	2.010	1.946	1.891	1.843	1.825	1.816
0.70	9.120	3.662	2.904	2.532	2.414	2.306	2.191	2.102	2.025	1.960	1.902	1.881	1.870
0.80	10.43	4.062	3.155	2.710	2.570	2.443	2.307	2.202	2.112	2.035	1.968	1.944	1.931
0.90	11.74	4.478	3.420	2.902	2.738	2.589	2.432	2.310	2.206	2.117	2.040	2.012	1.997
1.00	13.05	4.905	3.695	3.103	2.915	2.744	2.564	2.423	2.306	2.205	2.117	2.085	2.068
1.25	16.33	6.001	4.426	3.639	3.389	3.163	2.923	2.737	2.580	2.447	2.330	2.288	2.266
1.50	19.60	7.120	5.184	4.207	3.896	3.612	3.311	3.077	2.881	2.713	2.566	2.514	2.486
1.75	22.87	8.250	5.960	4.795	4.422	4.081	3.719	3.437	3.200	2.997	2.820	2.757	2.723
2.00	26.14	9.387	6.747	5.396	4.962	4.564	4.141	3.812	3.533	3.295	3.088	3.013	2.974
2.50	32.69	11.67	8.339	6.621	6.067	5.557	5.013	4.588	4.228	3.920	3.650	3.553	3.503
3.00	39.23	13.97	9.945	7.864	7.191	6.570	5.907	5.388	4.947	4.569	4.238	4.119	4.057
3.50	45.77	16.27	11.56	9.118	8.326	7.596	6.815	6.201	5.681	5.233	4.842	4.700	4.627
4.00	52.31	18.58	13.18	10.38	9.469	8.630	7.731	7.024	6.424	5.908	5.456	5.293	5.208
4.50	58.85	20.88	14.80	11.64	10.62	9.669	8.652	7.854	7.174	6.590	6.077	5.892	5.796
5.00	65.39	23.19	16.43	12.91	11.77	10.71	9.579	8.688	7.929	7.277	6.704	6.497	6.390
6.00	78.47	27.81	19.68	15.45	14.08	12.81	11.44	10.36	9.449	8.661	7.968	7.718	7.588
7.00	91.55	32.43	22.94	18.00	16.39	14.90	13.31	12.05	10.98	10.05	9.242	8.949	8.797
8.00	104.6	37.06	26.20	20.55	18.71	17.01	15.18	13.74	12.51	11.45	10.52	10.19	10.01
9.00	117.7	41.68	29.46	23.10	21.03	19.11	17.05	15.43	14.05	12.85	11.81	11.43	11.23
10.00	130.8	46.31	32.73	25.66	23.35	21.22	18.93	17.13	15.59	14.26	13.10	12.67	12.45

Sources: Land (1975) and Gilbert (1987).

TABLE 9

Z-SCORES FOR THE STANDARD NORMAL DISTRIBUTION

(i) Probability associated with specified Z-score

Z-Score	*Probability*	*Z-Score*	*Probability*	*Z-Score*	*Probability*	*Z-Score*	*Probability*
-4.00	0.00003	**-2.00**	0.0228	**0.00**	0.5000	**2.00**	0.9772
-3.95	0.00004	**-1.95**	0.0228	**0.05**	0.5199	**2.05**	0.9798
-3.90	0.00005	**-1.90**	0.0287	**0.10**	0.5398	**2.10**	0.9821
-3.85	0.0001	**-1.85**	0.0322	**0.15**	0.5596	**2.15**	0.9842
-3.80	0.0001	**-1.80**	0.0359	**0.20**	0.5793	**2.20**	0.9861
-3.75	0.0001	**-1.75**	0.0401	**0.25**	0.5987	**2.25**	0.9878
-3.70	0.0001	**-1.70**	0.0446	**0.30**	0.6179	**2.30**	0.9893
-3.65	0.0001	**-1.65**	0.0495	**0.35**	0.6368	**2.35**	0.9906
-3.60	0.0002	**-1.60**	0.0548	**0.40**	0.6554	**2.40**	0.9918
-3.55	0.0002	**-1.55**	0.0606	**0.45**	0.6736	**2.45**	0.9929
-3.50	0.0002	**-1.50**	0.0668	**0.50**	0.6915	**2.50**	0.9938
-3.45	0.0003	**-1.45**	0.0735	**0.55**	0.7088	**2.55**	0.9946
-3.40	0.0003	**-1.40**	0.0808	**0.60**	0.7257	**2.60**	0.9953
-3.35	0.0004	**-1.35**	0.0885	**0.65**	0.7422	**2.65**	0.9960
-3.30	0.0005	**-1.30**	0.0968	**0.70**	0.7580	**2.70**	0.9965
-3.25	0.0006	**-1.25**	0.1056	**0.75**	0.7734	**2.75**	0.9970
-3.20	0.0007	**-1.20**	0.1151	**0.80**	0.7881	**2.80**	0.9974
-3.15	0.0008	**-1.15**	0.1251	**0.85**	0.8023	**2.85**	0.9978
-3.10	0.0010	**-1.10**	0.1357	**0.90**	0.8159	**2.90**	0.9981
-3.05	0.0011	**-1.05**	0.1469	**0.95**	0.8289	**2.95**	0.9984
-3.00	0.0013	**-1.00**	0.1587	**1.00**	0.8413	**3.00**	0.9987
-2.95	0.0016	**-0.95**	0.1711	**1.05**	0.8531	**3.05**	0.9989
-2.90	0.0019	**-0.90**	0.1841	**1.10**	0.8643	**3.10**	0.9990
-2.85	0.0022	**-0.85**	0.1977	**1.15**	0.8749	**3.15**	0.9992
-2.80	0.0026	**-0.80**	0.2119	**1.20**	0.8849	**3.20**	0.9993
-2.75	0.0030	**-0.75**	0.2266	**1.25**	0.8944	**3.25**	0.9994
-2.70	0.0035	**-0.70**	0.2420	**1.30**	0.9032	**3.30**	0.9995
-2.65	0.0040	**-0.65**	0.2578	**1.35**	0.9115	**3.35**	0.9996
-2.60	0.0047	**-0.60**	0.2743	**1.40**	0.9192	**3.40**	0.9997
-2.55	0.0054	**-0.55**	0.2912	**1.45**	0.9265	**3.45**	0.9997
-2.50	0.0062	**-0.50**	0.3085	**1.50**	0.9332	**3.50**	0.9998
-2.45	0.0071	**-0.45**	0.3264	**1.55**	0.9394	**3.55**	0.9998
-2.40	0.0082	**-0.40**	0.3446	**1.60**	0.9452	**3.60**	0.9998
-2.35	0.0094	**-0.35**	0.3632	**1.65**	0.9505	**3.65**	0.9999
-2.30	0.0107	**-0.30**	0.3821	**1.70**	0.9554	**3.70**	0.9999
-2.25	0.0122	**-0.25**	0.4013	**1.75**	0.9599	**3.75**	0.9999
-2.20	0.0139	**-0.20**	0.4207	**1.80**	0.9641	**3.80**	0.9999
-2.15	0.0158	**-0.15**	0.4404	**1.85**	0.9678	**3.85**	0.9999
-2.10	0.0179	**-0.10**	0.4602	**1.90**	0.9713	**3.90**	0.99995
-2.05	0.0202	**-0.05**	0.4801	**1.95**	0.9744	**3.95**	0.99996
-2.00	0.0228	**0.00**	0.5000	**2.00**	0.9772	**4.00**	0.99997

TABLE 9

Z-SCORES FOR THE STANDARD NORMAL DISTRIBUTION

(ii) Z-score associated with specified Probability

Probability	*Z-Score*	*Probability*	*Z-Score*	*Probability*	*Z-Score*	*Probability*	*Z-Score*
0.000001	-4.753	**0.10**	-1.282	**0.50**	0.000	**0.90**	1.282
0.000005	-4.417	**0.11**	-1.227	**0.51**	0.025	**0.91**	1.341
0.000007	-4.344	**0.12**	-1.175	**0.52**	0.050	**0.92**	1.405
0.000009	-4.288	**0.13**	-1.126	**0.53**	0.075	**0.93**	1.476
0.00001	-4.265	**0.14**	-1.080	**0.54**	0.100	**0.94**	1.555
0.00002	-4.107	**0.15**	-1.036	**0.55**	0.126	**0.95**	1.645
0.00003	-4.013	**0.16**	-0.994	**0.56**	0.151	**0.96**	1.751
0.00004	-3.944	**0.17**	-0.954	**0.57**	0.176	**0.97**	1.881
0.00005	-3.891	**0.18**	-0.915	**0.58**	0.202	**0.98**	2.054
0.00006	-3.846	**0.19**	-0.878	**0.59**	0.228	**0.99**	2.326
0.00007	-3.808	**0.20**	-0.842	**0.60**	0.253	**0.991**	2.366
0.00008	-3.775	**0.21**	-0.806	**0.61**	0.279	**0.992**	2.409
0.00009	-3.746	**0.22**	-0.772	**0.62**	0.305	**0.993**	2.457
0.0001	-3.719	**0.23**	-0.739	**0.63**	0.332	**0.994**	2.512
0.0002	-3.540	**0.24**	-0.706	**0.64**	0.358	**0.995**	2.576
0.0003	-3.432	**0.25**	-0.674	**0.65**	0.385	**0.996**	2.652
0.0004	-3.353	**0.26**	-0.643	**0.66**	0.412	**0.997**	2.748
0.0005	-3.291	**0.27**	-0.613	**0.67**	0.440	**0.998**	2.878
0.0006	-3.239	**0.28**	-0.583	**0.68**	0.468	**0.999**	3.090
0.0007	-3.195	**0.29**	-0.553	**0.69**	0.496	**0.9991**	3.121
0.0008	-3.156	**0.30**	-0.524	**0.70**	0.524	**0.9992**	3.156
0.0009	-3.121	**0.31**	-0.496	**0.71**	0.553	**0.9993**	3.195
0.001	-3.090	**0.32**	-0.468	**0.72**	0.583	**0.9994**	3.239
0.002	-2.878	**0.33**	-0.440	**0.73**	0.613	**0.9995**	3.291
0.003	-2.748	**0.34**	-0.412	**0.74**	0.643	**0.9996**	3.353
0.004	-2.652	**0.35**	-0.385	**0.75**	0.674	**0.9997**	3.432
0.005	-2.576	**0.36**	-0.358	**0.76**	0.706	**0.9998**	3.540
0.006	-2.512	**0.37**	-0.332	**0.77**	0.739	**0.9999**	3.719
0.007	-2.457	**0.38**	-0.305	**0.78**	0.772	**0.99991**	3.746
0.008	-2.409	**0.39**	-0.279	**0.79**	0.806	**0.99992**	3.775
0.009	-2.366	**0.40**	-0.253	**0.80**	0.842	**0.99993**	3.808
0.01	-2.326	**0.41**	-0.228	**0.81**	0.878	**0.99994**	3.846
0.02	-2.054	**0.42**	-0.202	**0.82**	0.915	**0.99995**	3.891
0.03	-1.881	**0.43**	-0.176	**0.83**	0.954	**0.99996**	3.944
0.04	-1.751	**0.44**	-0.151	**0.84**	0.994	**0.99997**	4.013
0.05	-1.645	**0.45**	-0.126	**0.85**	1.036	**0.99998**	4.107
0.06	-1.555	**0.46**	-0.100	**0.86**	1.080	**0.99999**	4.265
0.07	-1.476	**0.47**	-0.075	**0.87**	1.126	**0.999991**	4.288
0.08	-1.405	**0.48**	-0.050	**0.88**	1.175	**0.999993**	4.344
0.09	-1.341	**0.49**	-0.025	**0.89**	1.227	**0.999995**	4.417
0.10	-1.282	**0.50**	0.000	**0.90**	1.282	**0.999999**	4.753

APPENDIX H

HHRA SAMPLE CALCULATIONS

APPENDIX H

EXPOSURE ASSESSMENT MODELS AND EQUATIONS

H.1

EQUATIONS AND SAMPLE CALCULATIONS – NON-CANCER

EXPOSURE TO DIELDRIN VIA INADVERTENT SOIL INGESTION BY A CONSTRUCTION/UTILITY WORKER

Dose (mg/kg-day) = C_s x IR_s x CF x RAF_{oral} x EF x ED x (1/BW) x (1/AT)

Where:
C_s = Maximum Concentration in Soil = 4.50 mg/kg (see Table F.6 of Appendix F)
IR_s = Soil Ingestion Rate = 100 mg/day
CF = Conversion Factor from mg to kg, where 1 mg = 10^{-6} kg/mg
RAF_{oral} = Relative Absorption Factor (bioavailability) from the GI tract = 100% (1.0)
EF = 65 days/year
ED = 35 years
AT = ED x 365 days/year = 12,775 days
BW = Body Weight = 70.7 kg

Dose (mg/kg/day) =
4.50 mg/kg x 100 mg/day x 10^{-6} kg/mg x 1.0 x 65 days/year x 35 years x (1/70.7 kg) x (1/12775 days)

Dose = 1.13E-06 mg/kg/day (see Table F.22 of Appendix F)

$$\text{Hazard Quotient} = \frac{\text{Estimated Exposure (Dose) (mg/kg/day)}}{\text{Tolerable Daily Intake (TDI) (mg/kg/day)}}$$

Where:
RfD for Dieldrin = 0.00005 mg/kg/day (see Table F.16 of Appendix F)

$$\text{Hazard Quotient} = \frac{\text{1.13E-06 mg/kg/day}}{\text{0.00005 mg/kg/day}}$$

Hazard Quotient = 0.0227 (see Table F.22 of Appendix F)

EXPOSURE TO DIELDRIN VIA DERMAL ABSORPTION FROM SOIL BY A CONSTRUCTION/UTILITY WORKER

Dose (mg/kg-day) = C_s x SA x CF x AF x RAF_{derm} x EF x ED x (1/BW) X (1/AT)

Where:
C_s = Maximum Concentration in Soil = 4.50 mg/kg (see Table F.6 of Appendix F)
SA = Surface area = 5000 cm^2
AF = Soil to skin adherence factor = 1 mg/cm^2
CF = Conversion Factor from mg to kg, where 1 mg = 10^{-6} kg/mg
RAF_{derm} = Relative Dermal Absorption Factor (bioavailability) = 0.10
EF = 65 days/year
ED = 35 years
AT = ED x 365 days/year = 12,775 days
BW = Body Weight = 70.7 kg

Dose (mg/kg/day) =
4.50 mg/kg x 5000 cm^2 x 10^{-6} kg/mg x 1 x 0.10 x 65 days/year x 35 years x (1/70.7 kg) x (1/12775 days)

Dose = 5.67E-06 mg/kg/day (see Table F.22 of Appendix F)

Hazard Quotient = $\frac{\text{Estimated Exposure (Dose) (mg/kg/day)}}{\text{Tolerable Daily Intake (TDI) (mg/kg/day)}}$

Where:
RfD for Dieldrin = 0.00005 mg/kg/day (see Table F.16 of Appendix F)

Hazard Quotient = $\frac{\text{5.67E-06 mg/kg/day}}{\text{0.00005 mg/kg/day}}$

Hazard Quotient = 0.113 (see Table F.22 of Appendix F)

EXPOSURE TO DIELDRIN VIA INHALATION OF SOIL VOLATILE BY A CONSTRUCTION/UTILITY WORKER

Dose (mg/m^3) = C_s x FT x EF x ED x VF x (1/AT)

Where:
C_s = Maximum Concentration in Soil = 4.50 mg/kg (see Table F.6 of Appendix F)
FT = Fraction of time exposed = 24 hours/24 hours
EF = 65 days/year
ED = 35 years
VF = volatilization factor = 1.61×10^{-6} kg/m^3 (see Table F.12 of Appendix F)
AT = ED x 365 days/year = 12775 days

Dose (mg/m^3) =
4.50 mg/kg x (24 hours/24 hours) x 65 days/year x 35 years x 1.61×10^{-6} kg/m^3 x (1/12775 days)

Dose = 1.29E-06 mg/m^3 (see Table F.22 of Appendix F)

$$\text{Hazard Quotient} = \frac{\text{Estimated Exposure (Dose) } (mg/m^3)}{\text{Tolerable Daily Intake (TDI) } (mg/m^3)}$$

Where:
RfC for Dieldrin = 0.00035 mg/m^3 (see Table F.17 of Appendix F)

$$\text{Hazard Quotient} = \frac{1.29E\text{-}06\ mg/m^3}{0.00035\ mg/m^3}$$

Hazard Quotient = 0.00369 (see Table F.22 of Appendix F)

CALCULATION OF CONSTRUCTION/UTILITY WORKER NON-CANCER HAZARD FROM EXPOSURE TO DIELDRIN FROM SOIL

$HI = HQ_{oral} + HQ_{derm} + HQ_{inhal}$

Where,

HI = Hazard Index

HQ_{oral} = Hazard Quotient from exposure to dieldrin through soil ingestion = 0.0227

HQ_{derm} = Hazard Quotient from exposure to dieldrin through dermal contact with soil = 0.113

HQ_{inhal} = Hazard Quotient from exposure to dieldrin from inhalation of soil volatile = 0.00369

$HI = 0.0227 + 0.113 + 0.00369$

Hazard Index = 0.14 (see Table F.25 of Appendix F)

H.2

EQUATIONS AND SAMPLE CALCULATIONS – CANCER

EXPOSURE TO DIELDRIN VIA INADVERTENT SOIL INGESTION BY A CONSTRUCTION/UTILITY WORKER

Dose (mg/kg-day) = C_s x IR_s x CF x RAF_{oral} x EF x ED x (1/BW) x (1/AT)

Where:
C_s = Maximum Concentration in Soil = 4.50 mg/kg (see Table F.6 of Appendix F)
IR_s = Soil Ingestion Rate = 100 mg/day
CF = Conversion Factor from mg to kg, where 1 mg = 10^{-6} kg/mg
RAF_{oral} = Relative Absorption Factor (bioavailability) from the GI tract = 100% (1.0)
EF = 65 days/year
ED = 35 years
AT = 60 years x 365 days/year = 21,900 days
BW = Body Weight = 70.7 kg

Dose (mg/kg/day) =
4.50 mg/kg x 100 mg/day x 10^{-6} kg/mg x 1.0 x 65 days/year x 35 years x (1/70.7 kg) x (1/21900 days)

Dose = 6.61E-07 mg/kg/day (see Table F.22 of Appendix F)

Cancer Risk =
Estimated Exposure (Dose) (mg/kg/day) x Oral Slope Factor (SFo) $(mg/kg/day)^{-1}$

Where:
SFo for Dieldrin = NA (see Table F.18 of Appendix F)

Cancer Risk = 6.61E-07 mg/kg/day x NA (no oral CSF toxicity value available)

Cancer Risk = NC (see Table F.22 of Appendix F)

EXPOSURE TO DEILDRIN VIA DERMAL ABSORPTION FROM SOIL BY A CONSTRUCTION/UTILITY WORKER

Dose (mg/kg-day) = C_s x SA x CF x AF x RAF_{derm} x EF x ED x (1/BW) X (1/AT)

Where:
C_s = Maximum Concentration in Soil = 4.50 mg/kg (see Table F.6 of the main report)
SA = Surface area = 5000 cm^2
AF = Soil to skin adherence factor = 1 mg/cm^2
CF = Conversion Factor from mg to kg, where 1 mg = 10^{-6} kg/mg
RAF_{derm} = Relative Dermal Absorption Factor (bioavailability) = 0.10
EF = 65 days/year
ED = 35 years
AT = 60 years x 365 days/year = 21,900 days
BW = Body Weight = 70.7 kg

Dose (mg/kg/day) =

4.50 mg/kg x 5000 cm^2 x 10^{-6} kg/mg x 1 x 0.10 x 65 days/year x 35 years x (1/70.7 kg) x (1/21900 days)

Dose = 3.31E-06 mg/kg/day (see Table F.22 of Appendix F)

Cancer Risk =
Estimated Exposure (Dose) (mg/kg/day) x Dermal Slope Factor (SFd) $(mg/kg/day)^{-1}$

Where:
SFd for Dieldrin = NA (see Table F.18 of Appendix F)

Cancer Risk = 3.31E-06mg/kd/day x NA (no oral CSF toxicity value available)

Cancer Risk = NC (see Table F.22 of Appendix F)

EXPOSURE TO DIELDRIN VIA INHALATION OF SOIL VOLATILES BY A CONSTRUCTION/UTILITY WORKER

Dose (mg/m^3) = C_s x FT x EF x ED x VF x (1/AT)

Where:
C_s = Maximum Concentration in Soil = 4.50 mg/kg (see Table F.6 of the main report)
FT = Fraction of time exposed = 24 hours/24 hours
EF = 65 days/year
ED = 35 years
VF = volatilization factor = 1.61×10^{-6} kg/m^3 (see Table F.12 of Appendix F)
AT = 60 years x 365 days/year = 21,900 days

Dose (mg/m^3) =
4.50 mg/kg x (24 hours/24 hours) x 65 days/year x 35 years x 1.61E-06 kg/m^3 x (1/21900 days)

Dose = 7.53E-07 mg/m^3 (see Table F.22 of Appendix F)

Cancer Risk =
Estimated Exposure (Dose) (mg/kg/day) x Inhalation Slope Factor (SFi) $(mg/kg/day)^{-1}$

Where:
SFi for Arsenic = NA $(mg/m^3)^{-1}$ (see Table F.19 of the main report)

Cancer Risk = 7.53E-07 mg/m^3 x NA (no inhalation URF toxicity value available)

Cancer Risk = NC (see Table F.22 of Appendix F)

CALCULATION OF CONSTRUCTION/UTILITY WORKER TOTAL CANCER RISK FROM EXPOSURE TO DIELDRIN FROM SOIL

Total Cancer Risk = $CR_{oral} + CR_{derm} + CR_{inhal}$

Where,

CR_{Total} = Total Cancer Risk

CR_{oral} = Cancer risk from exposure to dieldrin through soil ingestion = NC

CR_{derm} = Cancer Risk from exposure to dieldrin through dermal contact with soil = NC

CR_{inhal} = Cancer Risk from exposure to dieldrin from inhalation of soil volatiles = NC

CR_{Total} = NC (see Table F.25 of Appendix F)

APPENDIX I

INDOOR AIR MODELLING

TABLE OF CONTENTS

LIST OF TABLES
(Following Text)

1.0 INTRODUCTION

This Appendix presents the estimation of indoor air Exposure Point Concentrations (EPCs) for volatile Contaminants of Concern (COCs) in soil for the former Salmonier Correctional Facility (Site or Property). The Site is located approximately 50 kilometers (km) west of St. Johns Newfoundland on Salmonier Lane (Route 90), approximately 90 km from the intersection of Salmonier Lane and the Trans Canada Highway in Salmonier, Newfoundland. The estimated indoor air EPCs are applied in the Human Health Risk Assessment (HHRA) to assess potential health risks/hazards posed by the indoor air inhalation exposure pathway. Vapour migration into indoor air is of concern at the Site due to the presence of dieldrin in Site soil. Historically, the Site has been used for industrial/commercial purposes. However, future re-development plans for the Site will involve the construction of several cottages at the Site. Therefore, the proposed future use of the Site will be residential. As a result, the indoor air inhalation exposure pathway is considered complete for a future resident at the Site.

The estimated indoor air EPCs were modelled for volatile COCs in soil using the approach applied by Atlantic RBCA and Health Canada to develop generic soil standards that are protective of the soil to indoor air and groundwater to indoor air pathways. The approach is outlined in document entitled, "*Atlantic RBCA (Risk-Based Corrective Action), Version 2.0, for Petroleum Impacted Sites in Atlantic Canada, User Guidance, Update March 2007*" (Atlantic RBCA, 2007) and the Health Canada document entitled, "*Federal Contaminated Site Risk Assessment in Canada: Part VII: Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites: Appendix I - Derivation of Vapour Attenuation Factors for Health Canada Federal Screening, Draft*" (Health Canada, 2008), and is based on the Johnson and Ettinger (1991) model (J&E Model).

The methodology for developing the estimated indoor air EPCs is presented in Section 2.0. The input parameters applied to develop the EPCs are presented in Section 3.0. All references cited in this Appendix are listed in Section 4.0.

2.0 METHODOLOGY

The estimated indoor air EPCs were developed using the approach applied by the Atlantic RBCA (2007) and Health Canada (Health Canada, 2008), which is based on the J&E Model. Johnson and Ettinger (1991) present a model for estimating the degree of attenuation occurring as volatile contaminants in soil vapour migrate upward through the vadose zone, enter an overlying building, and mix with the indoor air of the building. The degree of attenuation is quantified through the calculation of an attenuation factor, α, after Johnson and Ettinger (1991; Equation 21).

The methodologies applied to estimate indoor air EPCs from the soil sampling results using the J&E Model are described in Section 2.1. A description of several conservative features inherent to the J&E Model is provided in Section 2.2.

2.1 DERIVATION OF ESTIMATED INDOOR AIR EPCs FROM SOIL

The Reasonable Maximum Exposure (RME) concentrations derived for the volatile COCs identified in soil (see Table 4.1 of the main report) were applied to estimate indoor air EPCs through a two-step process. First, soil vapour concentrations were estimated from the RME soil concentrations using equilibrium partitioning, or phase relationships, as follows [after USEPA (1996)]:

$$C_{sg} = \frac{C_{soil} \times \rho_{db} \times H \times CF_1}{\left(k_d \times \rho_{db} + \varepsilon_m + H\varepsilon_v\right)}$$

Where:

- C_{sg} - The estimated COC soil vapour concentration (micrograms per cubic metre [µg/m^3])
- C_{soil} - The COC RME concentration in soil (micrograms per gram [µg/g])
- ρ_{db} - The dry bulk soil density (grams per cubic centimeter [g/cm^3])
- ε_m - The moisture, or water, filled soil porosity (dimensionless)
- ε_v - The vapour, or soil vapour, filled soil porosity (dimensionless)
- k_d - The soil water partitioning coefficient equal to $K_{oc} \times f_{oc} \times PC$ [milliliters per gram (mL/g)], where K_{oc} is the compound organic carbon partitioning coefficient (mL/g), f_{oc} is the soil fraction of organic carbon content (dimensionless), and PC is a correction factor of 2, applied to the equilibrium partition equation to address the observed difference of 2 to

4 times between the measured and predicted soil vapour concentrations, as indicated in Health Canada (2008)

H - Compound-specific dimensionless Henry's Law constant equal to $H_L/(R \times T)$, where H_L is the dimensioned Henry's Law constant [atmospheres cubic metres per mole (atm m^3/mol)], R is the Universal Gas Law constant [8.206×10^{-3} atmospheres cubic metres per mole Kelvin (atm m^3/mol K)], and T is the vadose zone temperature in Kelvin

CF_1 - Unit conversion factor of 1,000,000 millilitres per cubic metre (mL/m^3)

Second, the estimated soil vapour concentrations are applied to predict the indoor air EPCs as follows:

$$C_{building} = C_{sg} \times \alpha$$

Where:

$C_{building}$ - The predicted COC indoor air concentration in a Site building (µg/m^3).

α - The Site-specific calculated soil vapour attenuation factor, which relates the indoor air concentration to the concentration in soil vapour directly above the source based on the heuristic model developed by Johnson and Ettinger (1991; Equation 21). The soil vapour attenuation factor accounts for the advective-diffusive migration of contaminants in soil vapour through the vadose zone soil and building foundation, and the subsequent mixing of contaminants with building indoor air.

The derivation of the Site-specific soil vapour attenuation factor for the soil to indoor air pathway was conducted through the application of the J&E Model for soil incorporated into a Microsoft Excel spreadsheet by the USEPA (USEPA, 2004; "SL-ADV-Feb04.xls, Version 3.1"). The Site-specific compound, vadose zone soil, and building properties applied in the derivation of the soil vapour attenuation factor, and thus the estimation of indoor air EPCs, are presented in Section 3.0.

2.2 CONSERVATIVE FEATURES OF J&E MODEL

It is important to note that the J&E Model used to develop the indoor air EPCs incorporates several conservative assumptions. The key conservative aspects incorporated into the J&E Model are described below:

- The J&E Model assumes that all contaminant vapours below a building migrate vertically upward into the building and do not move laterally, or in three-dimensions, around the building to vent to the atmosphere.
- The J&E Model assumes that no contaminant vapours migrate around the sides of buildings through preferential pathways, such as granular foundation bedding material, to vent to the atmosphere.
- the J&E Model assumes there is a constant and continuous source of COCs in the subsurface. Source depletion due to naturally occurring biological or chemical degradation of contaminants is not considered.

All of the conservative aspects described above combine to produce a higher estimate of indoor air EPCs than is actually expected to occur.

3.0 ESTIMATED INDOOR AIR EPCs

The estimated indoor air EPCs were developed using the J&E Model with Site-specific compound, vadose zone soil, and building properties, where possible. The compound-specific inputs applied in the J&E Model are described in Section 3.1. The details of the vadose zone conditions at the Site are presented in Section 3.2. The details of the building properties applied in the estimation of the indoor air EPCs are described in Section 3.3. The estimation of the indoor air EPCs is presented in Section 3.4.

3.1 COMPOUND PROPERTIES

The compound properties applied in the estimation of the indoor air EPCs consist of a Henry's Law constant, a water diffusion coefficient, and an air diffusion coefficient. The majority of applied compound properties were obtained from the chemical properties database implemented in USEPA (2004). The Henry's Law constants and air diffusion coefficients were corrected to a default vadose zone temperature of 15 degrees Celsius, as indicated in Health Canada (2008).

3.2 VADOSE ZONE CONDITIONS

The indoor air EPCs for the Site were estimated using the J&E Model with conservative default vadose zone soil properties, consistent with Health Canada (2008). The vadose zone at the Site is therefore assumed to consist primarily of sand and gravel fill.

3.2.1 SOIL TO INDOOR AIR

- Distance below grade to top of contamination, L_t :

  A distance of 11.26 centimeters (cm) was applied, based on the assumption that impacted soils occur directly beneath the building slab.

Soil Strata A – Coarse Soil Type

- Dry bulk density, δ_{db} :

  A dry bulk density value of 1.70 g/cm^3 was applied, based on the default dry bulk density for a coarse-grained soil type, as indicated in Atlantic RBCA (2007).

- Porosity, ε_T :

  A porosity value of 40 percent was applied, based on the default porosity for a coarse-grained soil type, as indicated in Atlantic RBCA (2007).

- Moisture-filled porosity, ε_m :

  A moisture-filled porosity value of 0.119 was applied, based on the default moisture-filled porosity for a coarse-grained soil type, as indicated in Atlantic RBCA (2007).

- Fraction of organic carbon content, f_{oc} (applied for the soil criteria only):

  A value of 0.5 percent was applied, consistent with the default fraction of organic carbon for a coarse-grained soil type, as indicated in Atlantic RBCA (2007).

- thickness of Soil Stratum A, h_A :

  A thickness of 11.25 cm was applied for a hypothetical building that may be constructed at the Site, as indicated in Atlantic RBCA (2007).

3.3 BUILDING PROPERTIES

The building properties applied in the development of the Site-specific indoor air concentrations consisted of the following:

- Enclosed space floor length, L_B :

  An enclosed floor space length of 1,000 cm was applied, based on the default residential building dimensions, as indicated in Atlantic RBCA (2007).

- Enclosed space floor width, W_B :

  An enclosed floor space width of 1,500 cm was applied, based on the default residential building dimensions, as indicated in Atlantic RBCA (2007).

- Enclosed space height, H_B :

  An enclosed space height of 244 cm was applied based on the default residential (slab-on-grade) building dimensions, as indicated in Health Canada (2008).

- Building indoor air exchange rate, ER :

  A building indoor air exchange rate value of 0.5 building volumes per hour was applied, consistent with the exchange rate, as indicated in Atlantic RBCA (2007).

- Floor-wall seam crack width, w :

  A floor-wall seam crack width value of 0.2 cm was applied for a default residential slab-on-grade building calculated based on the foundation crack fraction (0.00067), as indicated in Atlantic RBCA (2007).

- Vadose zone/building pressure differential, ΔP :

  A pressure differential value of 4 Pascal (Pa) was applied consistent with the default pressure differential for course-grained soils as indicated in Atlantic RBCA (2007).

- Foundation thickness, L_{crack} :

  A foundation thickness of 11.25 cm was applied, consistent with the default slab-on-grade foundation thickness, as indicated in Atlantic RBCA (2007).

- Depth below grade to bottom of enclosed space floor, L_F :

  A depth below grade to the bottom of enclosed space floor of 11.25 cm was applied for the building, consistent with the default depth below grade for a slab-on-grade building, as indicated in Atlantic RBCA (2007).

- Average vapour flow rate into building, Q_{soil} :

  A vapour flow rate into the building of 0.708 L/min was applied, consistent with the default flow rate into a residential building, as indicated in Atlantic RBCA (2007).

3.4 ESTIMATED INDOOR AIR EPC RESULTS

The estimated indoor air EPCs for soil to indoor air pathways are presented in Table I.1. The applied vadose zone soil, building, and chemical properties described in Sections 3.1 to 3.3 above are summarized in the aforementioned table. The resulting indoor air EPC is applied in the HHRA to assess potential health risks/hazards posed by the indoor air inhalation exposure pathway for residents.

4.0 REFERENCES

Atlantic RBCA, 2007. Atlantic RBCA (Risk-Based Corrective Action), Version 2.0, for Petroleum Impacted Sites in Atlantic Canada, User Guidance, Update March 2007.

Johnson, P.C. and R.A. Ettinger, 1991. Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapours into Buildings, Environmental Science and Technology, 25(8), pp. 1445-1452.

Health Canada, 2008. Federal Contaminated Site Risk Assessment in Canada: Part VII: Guidance for Soil Vapour Intrusion Assessment at Contaminated Sites: Appendix I - Derivation of Vapour Attenuation Factors for Health Canada Federal Screening, October 2008.

MOE, 2009. Rationale for the Development and Application of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario, December.

USEPA, 1996. Soil Screening Guidance: Technical Background Document. EPA Report No. EPA/540/R-95/128, Office of Emergency and Remedial Response, Washington, DC, May.

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TABLE I.1

DERIVATION OF INDOOR AIR EXPOSURE POINT CONCENTRATIONS FROM SOIL
HUMAN HEALTH RISK ASSESSMENT
FORMER SALMONIER CORRECTIONAL FACILITY
SALMONIER, NEWFOUNDLAND AND LABRADOR

Contaminant of Concern (COC)	*Chemical Properties (1)*						*Soil Maximum Concentration* C_{soil} *(2)*	*Johnson & Ettinger Attenuation Factor,* α *(3)*	*Soil Gas Concentration at Soil Source* C_{sg} *(4)*	*Indoor Air EPC in Building* $C_{building}$ *(5)*	
	Henry's Law Constant, H_L		*Water Diffusion Coefficient,* D^{H2O}		*Air Diffusion Coefficient,* D^{air}	*Organic Carbon Partitioning Coefficient,* K_{oc}					
	(atm m³/mol)		*(cm²/s)*		*(cm²/s)*	*(mL/g)*	*(µg/g)*		*(µg/m³)*	*(µg/m³)*	*(mg/m³)*
Pesticides											
Dieldrin	3.60E-06	(15°C)	4.74E-06	(25°C)	1.19E-02 (15°C)	2.14E+04	4.50E+00	2.29E-04	3.20E+00	7.35E-04	7.35E-07

Notes:

(1) The applied chemical properties for most chemicals are obtained from USEPA (2004). The Henry's Law constants and air diffusion coefficients were corrected for an average vadose zone temperature of 15°C. The reference temperature for the water diffusion coefficients is 25°C and, considering its low value, a correction to 15°C was considered negligible.

(2) Soil maximum concentration were obtained from Table F.6 of Appendix F.

(3) The soil gas attenuation factor α is based on the solution for soil gas migration to building indoor air presented in Johnson and Ettinger [1991; Equation (21)], the vadose zone and building properties listed below, and a 4 Pa pressure difference between the vadose zone and the building (ΔP) as applied by Atlantic RBCA (2007) for buildings. The calculation of the soil gas attenuation factor was conducted using the Excel spreadsheet "SL-ADV-Feb04.xls" developed by USEPA (2004) and the following Site-specific vadose zone and building properties.

Vadose Zone Soil Properties:		
Vadose Zone Temperature (°C)	15	Default vadose zone soil temperature, as indicated in Health Canada (2008).
Distance Below Grade to Top of Contamination, L_t (cm)	11.26	Based on the assumption that impacted soils occur directly beneath the building slab.
Soil Strata A - Coarse Soil:		
Total Porosity, ε_T (%)	40	Default porosity value for coarse-grained soil type, as indicated in Atlantic RBCA (2007).
Moisture-Filled Porosity, ε_m	0.119	Default moisture-filled porosity value for coarse-grained soil type, as indicated in Atlantic RBCA (2007).
Vapour-Filled Porosity, ε_v	0.281	Default vapour-filled porosity value for coarse-grained soil type, as indicated in Atlantic RBCA (2007).
Dry Bulk Soil Density, ρ_{db} (g/cm³)	1.70	Default dry bulk density value for coarse-grained soil type, as indicated in Atlantic RBCA (2007).
Fraction of Organic Carbon Content, f_{oc}	0.005	Default fraction of organic carbon content value for coarse-grained soil type, as indicated in Atlantic RBCA (2007).
Thickness of Soil Stratum A, h_A (cm)	11.25	Based on the thickness of Soil Stratum A, as indicated in Atlantic RBCA (2007).
Building Properties:		
Enclosed Floor Space Length, L_B (m)	10	Based on default residential slab-on-grade building dimensions, as indicated in Atlantic RBCA (2007).
Enclosed Floor Space Width, W_B (m)	15	Based on default residential building slab-on-grade dimensions, as indicated in Atlantic RBCA (2007).
Enclosed Space Height, H_B (m)	2.44	Based on default residential slab-on-grade building dimensions, as indicated in Health Canada (2008).
Building Air Exchange Rate, T_{air} (1/hr)	0.5	Based on default residential air exchange rate, as indicated in Atlantic RBCA (2007).
Floor-Wall Seam Crack Width, w (cm)	0.2	Default floor-wall seam crack width for residential buildings calculated based on the foundation crack fraction (0.00067), as indicated in Atlantic RBCA (2007).
Foundation Thickness, L_{crack} (cm)	11.25	Default thickness of Slab-on-Grade building foundation, as indicated in Atlantic RBCA (2007).
Depth Below Grade to Bottom of Enclosed Space Floor, Ls (cm)	11.25	Default thickness of Slab-on-Grade building foundation, as indicated in Atlantic RBCA (2007).
Average Vapour Flow Rate Into Building, Q_{soil} (L/min)	0.708	A vapour flow rate into the building of 0.708 L/min was applied, consistent with the default flow rate into a residential building, as indicated in Atlantic RBCA (2007).

(4) Soil gas concentration at the soil source determined from the C_{soil} using phase relationships and partitioning as follows, $C_{sg} = C_{soil} * \rho_{db} * H * CF/(k_d * \rho_{db} + \varepsilon_m + H * \varepsilon_v)$, the Henry's Law Constant is H=HL/(T*R), CF is a conversion factor of 106 mL/m³, T is the vadose zone temperature in Kelvin, the universal gas constant R is 8.206E-05 atm m³/ mol K, and $k_d = K_{oc} * f_{oc} * PC$, where PC is a partitioning coefficient of 2, as indicated in Health Canada (2008).

(5) The exposure point concentration in the building is calculated from $C_{building} = C_{sg} * \alpha/SDM$.

APPENDIX J

COPC TOXICITY PROFILES

TABLE OF CONTENTS

1.0 PESTICIDES

1.1 DDD, DDE, DDT

1. Constituent Properties

A. Physical and Chemical Properties

2,4'-DDE

Atomic Weight (g/mol):	318.03
Boiling Point:	no data
Melting Point:	no data
Specific Density:	no data
Water Solubility (mg/L):	0.14 (@ 25°C)
Vapor Pressure (mm Hg):	6.20E-05 (@ 25°C)
Henry's Law Constant (atm-m^3/mol):	1.80E-05

4,4'-DDD

Atomic Weight (g/mol):	320.05
Boiling Point:	350°C
Melting Point:	109°C
Specific Density:	1.385
Water Solubility (mg/L):	0.09 (@ 25°C)
Vapor Pressure (mm Hg):	1.35E-06 (@ 25°C)
Henry's Law Constant (atm-m^3/mol):	4.0E-06

4,4'-DDE

Atomic Weight (g/mol):	318.03
Boiling Point:	336°C
Melting Point:	89°C
Specific Density:	no data
Water Solubility (mg/L):	0.12 (@ 25°C)
Vapor Pressure (mm Hg):	6.0E-06 (@ 25°C)
Henry's Law Constant (atm-m^3/mol):	2.1E-05

4,4'-DDT

Atomic Weight (g/mol):	354.49
Boiling Point:	decomposes
Melting Point:	109°C
Specific Density:	0.99
Water Solubility (mg/L):	0.025 (@ 25°C)
Vapor Pressure (mm Hg):	1.6E-07 (@ 20°C)
Henry's Law Constant (atm-m^3/mol):	8.3E-06

Reference: ATSDR, 2002a. Toxicological Profile for DDD, DDE, and DDT.

B. Chemical Transformation

Air: In the atmosphere, about 50% of DDT is adsorbed to particulates and the other half exists in the vapor phase. In the vapor phase,

DDT reacts with photochemically produced hydroxyl radicals. Both DDE and DDD have high vapor pressures than DDT, therefore a small percentage of these analytes will adsorb to particulates. Direct photolysis may also occur (ATSDR, 2002a).

Water: These compound may be converted by both photodegradation and biodegradation. Direct photolysis primarily occurs in surface water and is dependent on the clarity of water. Biodegradation of DDT in water is reported to be a minor mechanism and biodegradation of DDD and DDE is slower than that of DDT (ATSDR, 2002a).

Soil: The fate of DDE and DDT can be either one of the following: volatilization, photooxidation or biodegradation. Under aerobic conditions, DDT converts to DDE and under anaerobic conditions, DDT converts to DDD (ATSDR, 2002a).

2. Toxicological Properties

A. Metabolism

DDT is initially metabolized in the liver to DDE and DDD. DDT undergoes reductive dechlorination to DDD. This is further degraded in the kidney to readily excreted DDA. DDE is degraded at a slower rate by dehydro-chlorination. Further metabolism of DDE in the kidney produces the metabolite DDA. Absorbed DDT is primarily excreted in urine, mostly as conjugated DDA with minor amounts excreted in the feces (ATSDR, 2002a).

B. Acute Toxicity

Only one case of fatal poinsoning after accidental oral exposure to DDT was reported. One ounce of 5% DDT in kerosene was ingested by a 1-year-old child. Clinical symptoms included coughing and vomiting followed by tremors and convulsions. The child then became comatose and died. Doses as high as 285 mg/kg had been accidentally ingested by humans with no fatal results (ATSDR, 2002a).

Acute, high exposures of DDT in humans primarily affect the nervous system. DDT, at a low dosage of 6 mg/kg, produced no illnesses in humans but perspiration, headache and nausea were reported. Convulsions in humans have been reported at doses of 16 mg/kg and higher. Higher concentrations of 250 to 1,500 mg DDT orally administered to humans exhibit sensitivity of the lower part of the face, dizziness, cold sweats, tremors, headache, fatigue, malaise, confusion and vomiting. Within 24 hours, all volunteers had recovered completely (ATSDR, 2002a). Rats exposed to a single dose ranging from 50 to 600 mg/kg/day of DDT had reported effects of tremors, abrupt and involuntary contractions of skeletal muscles, hyperexcitability and convulsions (ATSDR, 2002a).

It has been noted that dermal contact with DDT and DDE produced minor skin irritations. Inhalation exposure to DDT and DDE is expected to be minimal since their large particle size restricts inhalation absorption. Instead, they are deposited on the upper respiratory tract where they are swallowed. After inhalation, people complained of irritation to the eyes, nose and throat (ATSDR, 2002a).

C. Subacute and Chronic Toxicity

Chronic exposure to DDT in small amounts would not cause any permanent effects in humans. In a study where workers were exposed to 14 to 42 mg/day, no evidence of hyperexcitability were observed in the workers and neurological examinations were reported to be normal. However in chronic oral exposure, animal studies reported neurological and hepatic effects. These symptoms included increased liver weights to cellular necrosis and hyperactivity and tremors. Based on induction profiles obtained in rats, DDT and related compounds are considered primarily as phenobarbital-type inducers (ATSDR, 2002a).

D. Carcinogenicity

There are several animal studies reporting that DDE and DDT are cancer causing agents. A study where DDT was fed to rats for 2 years caused liver tumors at all dose levels ranging from 10 to 800 ppm and in mice, DDT administered chronically in the diet produced liver tumors at doses of 19 to 34 mg/kg/day for 30 to 78 weeks (USEPA, 1996a; ATSDR, 2002a). Twenty-five animal carcinogenicity assays have been reviewed for DDT. Both hepatocellular adenomas and carcinomas were observed in six mouse liver tumor studies. Both benign and malignant lung tumors were observed in two studies wherein mice were exposed both *in utero* and throughout their lifetime. Doses producing increased tumor incidence ranged from 0.15 to 37.5 mg/kg/day (USEPA, 1996a). USEPA has classified DDT as B2; probable human carcinogen based on observation of tumors (generally of the liver) in seven studies in various mouse strains and three studies in rats. The International Agency for Reseach on Cancer (IARC) has classified DDT in Group 2B as an agent that is possibly carcinogenic to humans (IARC, 2010). DDT is structurally similar to other probable carcinogens, such as DDD and DDE.

A study where administered DDE in feed at doses of 148 and 261 ppm to mice for 78 weeks reported an increase in incidence of hepatocellular carcinomas in males and females in comparison with controls. Increased weight loss and mortality was observed in females. Another study where DDE (250 ppm) was administered to mice in feed for lifetime (130 weeks) reported a significant increase in incidence of hepatomas observed in both males and females in comparison with controls. In females, 98% of the 55 surviving exposed animals developed hepatomas, compared to 1% of the surviving controls. Thyroid tumors was observed in female rats who were fed DDE at doses of 242 ppm and 462 ppm for 78 weeks.

USEPA has classified DDE as B2; probable human carcinogen based on increased incidence of liver tumors including carcinomas in two strains of mice and in hamsters and of thyroid tumors in female rats by diet (USEPA, 1988a).

Mice fed DDD for 130 weeks at 250 ppm had a statistically significant increase in incidence of lung tumors seen in both sexes compared with controls. In males, a statistically significant increase in incidence of liver tumors was also seen.

One study where mice were given DDD doses of 350 or 630 ppm for 5 weeks, 375 or 750 ppm for 11 weeks, and 425 or 850 ppm for the next 62 weeks reported an increased incidence of hepatocellular carcinomas seen in both sexes by comparison to controls. Another study also fed DDD at 1,647 and 3,294 ppm TWA for males and 850 and 1,700 ppm TWA for females for 78 weeks to rats. Males were fed 1,400 or 2,800 ppm for 23 weeks followed by 1,750 or 3,500 ppm for 55 weeks. Females were fed 850 or 1,700 ppm for the entire 78 weeks. After an additional 35 weeks, an increased incidence of thyroid tumors (follicular cell adenomas and carcinomas) was observed in males. USEPA has classified DDD as B2; probable human carcinogen based on an increased incidence of lung tumors in male and female mice, liver tumors in male mice and thyroid tumors in male rats. DDD is structurally similar to, and is a known metabolite of DDT, a probable human carcinogen (USEPA, 1988b).

E. Mutagenicity

There are human studies to suggest that DDT may cause chromosomal aberrations. Blood cultures of occupationally exposed workers, exhibited an increase in chromatid lesions. Another study reported an increase of sister chromatid exchanges and chromosomal aberrations in peripheral lymphocytes compared to a control group (ATSDR, 2002a). Positive effects were found with DDD in mammalian cytogenetic assays and a host-mediated assay (USEPA, 1988b). DDE was mutagenic in mouse lymphoma (L5178Y) cells and chinese hamster (V79) cells, but not in Salmonella (USEPA, 1988a). DDT has produced both negative and positive responses in tests for genotoxicity. Positive responses have been noted in V79 mutation assays, for chromosome aberrations in cultured human lymphocytes, and for sister chromatid exchanges in V79 and CHO cells. In one study, DDT was reported to interact directly with DNA; this result was not confirmed in the absence of a metabolizing system (USEPA, 1996a).

F. Teratogenicity/Reproductive Effects

After acute and chronic exposures, animal studies reported adverse reproductive effects. These included a decrease in fertility, stillbirths and increase in fetal mortality. DDE and DDT are embryotoxic and fetotoxic. After acute oral exposure of animals to DDT resulted in decreased fetal body and organ weights, increases in resorption and prematurity.

Chronic oral exposure resulted in mortality, slowed development and premature puberty (ATSDR, 2002a).

G. Other Health Effects

These compounds may cause immunotoxicity. The effects reported include decreases in antibodys and plaque-forming cells, increases in gamma globulin and serum immunoglobulin, alterations in the spleen and increased growth of the leprosy bacterium. The immunotoxicity of these compounds is increased by low protein diet and physical/emotional stress (ATSDR, 2002a).

H. Epidemiological Evidence

There are several acute oral exposure studies to humans documenting DDE and DDT are irritants to the eyes, nose, and throat and may cause symptoms such as sweating, nausea, headache, tremors and convulsions (ATSDR, 2002a).

I. Toxicity Data

The chronic oral cancer slope factors are 0.24 $(mg/kg/day)^{-1}$, 0.34 $(mg/kg/day)^{-1}$ and 0.34 $(mg/kg/day)^{-1}$ for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT, respectively. A unit risk factor of 0.097 $(mg/m^3)^{-1}$ is reported for 4,4'-DDT. A chronic reference dose (RfD) for DDT is 0.01 mg/kg-day for the oral route of exposure. No RfD was reported for DDD and DDE, as well, inhalation toxicity data is not available. All of the aforementioned toxicity values were was taken from USEPA, 2010 with the exception of DDT RfD which was taken from Health Canada, 2009.

1.2 CHLORDANE

1. Constituent Properties

A. Physical and Chemical Properties

Atomic Weight (g/mol):	409.76
Melting Point (°C):	104-106
Boiling Point (°C):	175
Specific Density:	1.59 (@ 20°C)
Water Solubility (mg/L):	1.85
Vapor Pressure (mm Hg):	2.2E-05 (@ 20°C)
Henry's Law Constant (atm-m^3/mol):	4.85E-05

Reference: ATSDR, 1994. Toxicological Profile for Chlordane.

B. Chemical Transformation

Air: Chlordane degrade in air by both photolysis and oxidation.

Water: Chlordane is not expected to degrade in aquatic environments, instead it is expected to strongly adhere to particulates. Some loss may be due to volatilization.

Soil: It is expected to adsorb to particulates or volatilize to the atmosphere.

2. Toxicological Properties

A. Metabolism

Following absorption, chlordane initially is distributed to the liver and kidneys, followed by redistribution to adipose tissue. In these fatty tissues, this compound will persist for long periods of time. Metabolism results in a number of oxidation products, including oxychlordane, chlordene chlorohydrin and monohydroxylated dihydrochlordene (ATSDR, 1994).

B. Acute Toxicity

Acute exposure to chlordane causes neurological effects in humans. These effects include headache, dizziness, irritability, muscle tremors, confusion, convulsions, and coma. Gastrointestinal symptoms such as nausea, abdominal pain and diarrhea may result from effects on the nervous system. The occurrence of jaundice in humans living in chlordane treated homes or persons working with this chemical as a pesticide applicator develop alteration of serum enzyme levels indicating that the kidney is an important target organ in humans (ATSDR, 1994).

C. Subacute and Chronic Toxicity

Chronic inhalation exposure of humans in chlordane-treated homes and in gardens had incidences of skin neoplasms. Farmers exposed to chlordane in a case-control study had small increases of non-Hodgkin's lymphoma. Several cases of leukemia were reported in pest control operators. No deaths are reported for humans or animals exposed to atmospheric chlordane. In a study where mice was fed 3.25 mg/kg/day for 25 weeks, it was noted that chlordane may induce liver neoplasms. Accidental ingestion by children of chlordane is the only reported cases to cause death in humans. Animal studies fed chlordane reported deaths. For example, rats gavaged with 50 mg/kg/day for 15 consecutive days reported to be lethal (ATSDR, 1994)

D. Carcinogenicity

Oral exposure to chlordane has been noted to cause hepatocellular carcinomas in mice in several studies (ATSDR, 1994). USEPA has classified chlordane as a probable human carcinogen (Group B2) due to sufficient evidence of carcinogenicity in animal studies. IARC has classified chlordane in Group 2B as an agent that is possibly carcinogenic to humans (IARC, 2010).

E. Mutagenicity

Chlordane induced forward mutation in mouse lymphoma cells without metabolic activation and also induced sister chromatid exchange in human lymphoid cells. Dermal application of chlordane to mice induced

micronuclei formation in the bone marrow cells and nuclei aberrations in the hair follicles (ATSDR, 1994).

F. Teratogenicity/Reproductive Effects

Oral exposure to a large dose of chlordane resulted in decreased fertility in rats and resulted in the death of all offspring before weaning. The death of the offspring may have resulted from chlordane residues in milk transferred from the mother. Developmental effects include subtle behavioral and immunological effects in mice after oral exposure to chlordane (ATSDR, 1994).

G. Other Health Effects

Dermal contact to chlordane was reported to cause seizures in a nursery owner who handled soil contaminated with chlordane. Inhalation exposure to chlordane was reported to cause respiratory infections and sore throat to humans shortly after their home was treated for termites (ATSDR, 1994).

H. Epidemiological Evidence

There are several epidemiological studies investigating chlordane as a carcinogen in humans exposed at home or occupationally. Dermatitis, migraine headaches, skin neoplasms, uterine and ovarian disease, and a weak association to leukemia have been reported in these studies (ATSDR, 1994).

I. Toxicity Data

The chronic oral cancer slope factor is 0.35 $(mg/kg\text{-}day)^{-1}$. The chronic inhalation unit risk is 0.1 $(mg/m^3)^{-1}$. The chronic oral reference dose is 0.0005 mg/kg-day. The chronic inhalation reference concentration is 0.0007 mg/m^3. All of the aforementioned toxicity data is taken from USEPA, 2010.

1.3 DIELDRIN

1. Constituent Properties

Atomic Weight (g/mol):	308.93
Melting Point:	175°C
Boiling Point:	330°C
Specific Density:	1.75 (@ 20°C)
Water Solubility (mg/L):	0.18
Vapor Pressure (mm Hg):	1.78E-07 (@ 20°C)
Henry's Law Constant ($atm\text{-}m^3/mol$):	1.51E-05

Reference: ATSDR, 2002b. Toxicological Profile for Aldrin/Dieldrin.

B. Chemical Transformation

Air: Dieldrin will adsorb to particulate matter in air (ATSDR, 2002b).

Water: Dieldrin is photochemically isomerized by sunlight to photodieldrin (ATSDR, 2002b).

Soil: Dieldrin in soils may also be photodecomposed to photodieldrin. Although this compound is resistant to biodegradation it has been reported that dieldrin maybe subjected to aerobic degradation producing aldrin diol (ATSDR, 2002b).

2. Toxicological Properties

A. Metabolism

Several metabolic studies indicate that dieldrin is absorbed from the gastrointestinal tract and is transported via the hepatic portal vein. Two major metabolic routes of dieldrin predominate: (1) direct oxidation by cytochrome oxidases to give 9-hydroxydieldrin, and (2) the opening of the epoxide ring by epoxide hydrases, resulting in 6,7-trans-dihydroxydihydroaldrin (ATSDR, 2002b).

B. Acute Toxicity

Acute high-level exposure of humans to dieldrin has been observed to cause central nervous system excitation culminating in convulsions. The other effect observed in humans after acute high-level exposure is renal toxicity. Adverse effects on the kidneys were observed in rats and dogs exposed to dieldrin. These studies reported degenerative changes in the epithelial cells of the kidney, lymphocyte and macrophage infiltration, vascular congestion in the renal cortex, and hyaline casts in the renal tubules (ATSDR, 2002b).

C. Subacute and Chronic Toxicity

Longer-term exposure of humans in occupational settings has been associated with occasional cases of central nervous system intoxication resulting in convulsions. Following relatively long-term exposure to constant levels of dieldrin, a steady state of body levels is achieved. Other symptoms reported by workers exposed to dieldrin included headaches, dizziness, hyperirritability, anorexia, muscle twitching and jerking. For the most part, studies in animals support the observation of these toxic effects in humans. In addition, studies in animals indicate that other toxic effects may be associated with exposure to sufficiently high levels of dieldrin. These include hepatic degeneration and immunosuppression (ATSDR, 2002b).

D. Carcinogenicity

There are several studies in mice that strongly indicate that dieldrin is a promoter of tumors. Mice exposed to dieldrin reported hepatocellular tumors and in other studies, dieldrin was expected to induce pulmonary, lymphoid, thyroid and other tumors (ATSDR, 2002b). Based on the conclusion that there is sufficient animal evidence of carcinogenicity,

USEPA has classified dieldrin as B2, probable human carcinogen. However, IARC has classified dieldrin in Group 3 as an agent that is not classifiable as to its carcinogenicity to humans (IARC, 2010). Health Canada references the IARC classification in its Canadian Drinking Water Quidelines, which are also referenced in HC, 2009a: PQRA Part II - Health Canada Toxicological Reference Values and Chemical Specific Factors, Draft Version 2.0, 2009.

E. Mutagenicity

Significant increases in chromosomal aberrations have been reported in cultured human lung cells. Similar results were observed in bone marrow cells in mice treated with dieldrin. There are other animal studies that suggest dieldrin to be mutagenic (ATSDR, 2002b).

F. Teratogenicity/Reproductive Effects

Hamsters and mice exposed to very high dosages of dieldrin were reported to have external malformations. Decreased postnatal survival was reported in a number of animal studies (ATSDR, 2002b).

G. Other Health Effects

Respiratory effects have been noted in workers manufacturing dieldrin. An increase in pulmonary diseases and pneumonia were reported in these workers (ATSDR, 2002b).

H. Epidemiological Evidence

For dieldrin, epidemiological studies reported were mainly done on occupationally exposed individuals. These studies support the finding that the central nervous system is the main target organ resulting in convulsions (ATSDR, 2002b).

I. Toxicity

Dieldrin's chronic oral reference dose is 1.0E-04 mg/kg-day which was taken from Health Canada, 2009 (allowable daily intake (ADI) for aldrin + dieldrin) A chronic inhalation reference dose is reported to be 0.35 $\mu g/m^3$, which was taken from RIVM, 2001.

1.4 ENDRIN

1. Constituent Properties

A. Physical and Chemical Properties

Endrin

Atomic Weight (g/mol):	380.9
Melting Point (°C):	235
Boiling Point (°C):	245
Specific Density:	1.7 (@ 20°C)

Water Solubility (mg/L):	0.2
Vapor Pressure (mm Hg):	2.0E-07 (@ 25°C)
Henry's Law Constant (atm-m^3/mol):	4.0E-07

Reference: ATSDR, 1996. Toxicological Profile for Endrin.

B. Chemical Transformation

Air: Endrin may undergo photochemical isomerization to yield primarily endrin ketone and lesser amounts of endrin aldehyde. As well, endrin may also be transformed by heat in the atmosphere yielding endrin ketone and endrin aldehyde. All of the isomers may react with photochemically produced hydroxyl radicals with half-lives reported up to 1.5 days (ATSDR, 1996).

Water: Endrin released to waters will either be photodegraded or adsorb to sediments and particulate matters (ATSDR, 1996).

Soil: Endrin are persistent in the environment. Biodegradation is not a significant degradation process and the estimated half-life is reported at greater than 10 years. In combination, losses of volatilization, photodegradation and heat transformation are likely to account for loss of endrins from soils (ATSDR, 1996).

2. Toxicological Properties

A. Metabolism

Endrin appears to be well absorbed orally, and distribution is primarily to fat and skin. Endrin is excreted in urine and feces, with the major metabolites being anti-1,2-hydroxyendrin, and the corresponding sulfate and glucuronide metabolites. No information was available for endrin aldehyde or endrin ketone (ATSDR, 1996)

B. Acute Toxicity

The central nervous system is the primary target site for endrin toxicity. Convulsions and death have occurred within a few hours of ingestion. Less severe symptoms include headache, convulsions, dizziness, nausea, vomiting, nervousness, and confusion. Animals exposed via inhalation, oral and dermal routes confirm that endrin affects the nervous system, causing clinical symptoms including tremors and convulsions. Decreases in body weight gain, and histopathologic damage to liver and kidneys have been reported in animals after acute oral exposure to endrin. No acute studies have been conducted to evaluate the adverse health effects in humans or animals following exposure to endrin aldehyde or endrin ketone by the inhalation, oral or dermal routes (ATSDR, 1996).

C. Subacute and Chronic Toxicity

Studies in animals indicate that exposure to endrin via inhalation can be lethal and cause effects on the nervous system, respiratory system, liver, brain, adrenals and kidneys (ATSDR, 1996). Studies of humans

chronically exposed to endrin in the occupational setting indicate the target tissues similar to those for acute oral exposure, those being the liver and kidneys. No chronic studies have been conducted to evaluate the adverse health effects in humans or animals following exposure to endrin aldehyde or endrin ketone by the inhalation, oral or dermal routes (ATSDR, 1996).

D. Carcinogenicity

A retrospective cohort study was conducted to examine the mortality of workers employed in the manufacture of organochlorine pesticides including endrin. No statistically significant excesses or deficits in mortality for any specific cancer site were noted. Multiple studies conducted on rats and mice resulted in no evidence of carcinogenicity in any of these studies. Another study also failed to note any increase in tumorigenesis in dogs exposed up to 18.7 months at the maximum tolerated dose. USEPA has classified endrin as D, not classifiable as to carcinogenicity for humans based on the oral administration of endrin did not produce carcinogenic effects in either sex of two strains of rats and three strains of mice. A bioassay was suggestive of responses in male and female rats although the study reported a no evidence conclusion. The inadequacies of several of the bioassays call into question the strength of the reported negative findings. These inadequacies and the suggestive responses in the one of the bioassay do not support a Group E classification; rather a Group D classification best reflects the equivocal data (USEPA, 1993a). IARC has classified endrin in Group 3 as an agent that is not classifiable as to its carcinogenicity to humans (IARC, 2010).

E. Mutagenicity

A study reported that endrin was not genotoxic in the hepatocyte primary culture (HPC)/DNA repair assay using hepatocytes from male Fischer F344 rats, male CD-1 mice, and male Syrian hamsters. DNA repair was observed in response to a positive control in all three systems. Endrin was not mutagenic in microbial systems with or without metabolic activation, and endrin exposure did not significantly affect sister-chromatid exchange frequencies in a human lymphoid cell line (USEPA, 1993a).

F. Teratogenicity/Reproductive Effects

No studies are available on the reproductive effects of endrin after inhalation and dermal exposures, however, early single and three generation studies in dogs and rats suggest endrin can affect reproductive outcomes. Prenatal exposure of animals to concentrations of endrin to cause maternal toxicity resulted in developmental effects, to include fused ribs, cleft palate, exencephaly, microencephaloceles, and open eyes in pups (ATSDR, 1996).

G. Other Health Effects

Respiratory effects have been reported in both occupationally exposed individuals and animal studies. Deaths due to pneumonia and other nonmalignant respiratory diseases were noted in workers at a plant manufacturing endrin. Pulmonary edema was observed in a patient poisoned with endrin. Animal studies reported focal hemorrhage and congestion of the lungs (ATSDR, 1996).

H. Epidemiological Evidence

The existing epidemiological studies provided are limited to occupationally-exposed individuals and accidental or intentional ingestion of endrin. These reports concur that the central nervous system is the main target after exposure to endrin (ATSDR, 1996).

I. Toxicity Data

The chronic oral reference dose is 0.0003 mg/kg-day which was taken from USEPA, 2010.

1.5 HEXACHLOROBENZENE (HCB)

1. Constituent Properties

A. Physical and Chemical Properties

Molecular Weight:	284.78
Melting Point:	231°C
Boiling Point:	325°C
Specific Density:	2.044 (@ 23°C)
Water Solubility (mg/L):	0.006 (@ 25°C)
Vapor Pressure (mm Hg):	1.09E-05 (@ 20°C)
Henry's Law Constant (atm-m^3/mol):	5.8E-04

Reference: ATSDR, 2002c. Toxicological Profile for Hexachlorobenzene.

B. Chemical Transformation

Air: The atmosphere is not a significant reservoir for HCB. Typically, HCB will exist in both the vapor phase in association with particulates. Photodegradation of HCB through irradiation with ultraviolet radiation produced hydrogen chloride and carbon dioxide. Half-life of HCB in the atmosphere has been reported to range from 0.63 to 6.28 years (ATSDR, 2002c).

Water: HCB is not significantly degraded by either abiotic or biodegradation processes in the water. It mainly absorbs onto particulate matter in the water and then be transported to bottom sediment. In surface water, half-life was reported

at a range of 2.7 to 5.7 years and in groundwater, the half-life was reported to range from 5.3 to 11.4 years (ATSDR, 2002c).

Soil: Because of it's high sorption characteristics, HCB is expected to be immobile in soils and is unlikely to leach to groundwater. Studies have reported that HCB was dechlorinated to tri- and dichlorobenzenes under anaerobic conditions. Half-lives were reported to range from 3 to 6 years (ATSDR, 2002c).

2. Toxicological Properties

A. Metabolism

Results of animal studies show that HCB is slowly metabolized to pentachlorophenol, conjugated with glutathione to yield pentachlorothiophenol, or reductively dechlorinated to form pentachlorobenzene. Other metabolites include less chlorinated benzenes, chlorophenols, S-conjugated phenols and benzenes. Pentachlorophenol is subsequently converted to tetrachloro-4-hydroquinone (ATSDR, 2002c).

B. Acute Toxicity

No human studies regarding health effects were located for acute exposure to HCB. Extensive study of animals exposed by the oral route have identified a wide range of health effects including porphyria and other hepatic effects, renal tubular lesions, changes in thyroid and reproductive hormone levels, neurological effects and lethality. Acute studies by inhalation exposure to animals were limited to a single study which reported immunological effects. There is one dermal study that suggests HCB can be absorbed across the skin (ATSDR, 2002c).

C. Subacute and Chronic Toxicity

There are a limited inhalation studies regarding human exposure to HCB in the work place. Effects reported in these studies included liver (strongly with increased porphyrins and weakly with hepatocellular carcinoma), immunological effects with symptoms of decreased neutrophil activity, increased immunoglobulins and susceptibility to infections, and renal effects (microproteinuria). Workers and residents exposed to airborne HCB pollution from an organochlorobenzene factory has been linked with elevated blood levels and hepatic effects (increased porphyrins and hepatic enzymes), thyroid effects (decreased thyroxine levels, weakly with hypothyroidism, goiter and thyroid cancer) and impaired development of locomotor skills in infants (ATSDR, 2002c).

Striking evidences was found in studies of a population orally exposed to HCB in Turkey between the years of 1955 through 1959. An extremely high rate of mortality occurred in infants under 2 years of age who had been breast fed by mothers who ingested contaminated bread. Poisoned infants displayed a condition known as "pink sore" because of the

associated skin lesions. Infant deaths were associated with cardiorespiratory failure secondary to the disease. Other clinical symptoms to the population included weakness, convulsions, loss of appetite, arthritis, hepatomegaly, enlarged thyroid, and inability to perform simple, everyday tasks. Clinical symptoms persisted in most subjects, including high porphyria, dermal lesions, multiple neurological effects, skeletomuscular effects, enlarged liver, and enlarged thyroid. The buildup of high levels of porphyrins in the body is known to cause liver (cirrhosis, siderosis, focal necrosis and hyperplasia) and kidney (renal failure) damage (ATSDR, 2002c).

D. Carcinogenicity

Animal studies show that oral HCB exposure can cause cancer of the liver, kidney, lungs, lymphatic system, blood, and thyroid (ATSDR, 2002c). No malignant tumors have been reported in humans following exposure to HCB by any route. USEPA classifies HCB as a probable human carcinogen (Group B2) with sufficient evidence in animals studies. The basis, when HCB was orally administered, had been shown to induce tumors in the liver, thyroid and kidneys in three rodent species (USEPA, 1996b). IARC has classified HCB in Group 2B as an agent that is possibly carcinogenic to humans (IARC, 2010).

E. Mutagenicity

HCB tested negative for most mutagenic tests systems. These limited data suggest that HCB might not be genotoxic (ATSDR, 2002c).

F. Teratogenicity/Reproductive Effects

Distribution studies have identified the ovaries as a site of HCB accumulation, which have resulted in ovarian lesions at doses as low as 0.01 mg/kg/day of HCB. Higher doses have reported changed in organ weight, degenerative changes, and disruptions in steroidogenesis (estrogen and progesterone). In adult pregnant women who had been exposed to HCB as children, suggestive evidence of elevated incidences of miscarriages and stillbirths were found (ATSDR, 2002c).

The poisoning epidemic in Turkey, demonstrated that HCB is a developmental toxin. Immediate symptoms included mortality and skin lesions, where persistent symptoms included dermal, neurological, skeletomuscular, hepatic and thyroid effects. Animal studies have verified that HCB impaired neurological development and reduced neonatal viability and growth (ATSDR, 2002c).

G. Other Health Effects

The studies in humans in Turkey demonstrated skin lesions, called "black sore". It appeared after approximately 6 months of exposure. Symptoms included photosensitivity, skin ulcers and scarring, hyperpigmentation, and hirsutism (ATSDR, 2002c).

H. Epidemiological Evidence

The health effects of HCB have been identified in cohorts from a group of approximately 4,000 people orally exposed in Turkey to HCB in contaminated bread between 1955 and 1959. These effects included death, neurological, liver, skin, thyroid, skeletal, developmental and endocrine. Workers in the factory and residents living nearby the organochlorine factory in Spain exposed to airborne HCB pollution identified the health effects of hepatic, renal, endocrine and neurological (ATSDR, 2002c).

I. Toxicity Data

HCB has a reported oral cancer slope factor of 0.83 $(mg/kg\text{-}day)^{-1}$ (Health Canada, 2009) and a inhalation unit risk factor of 0.46 $(mg/m^3)^{-1}$ (USEPA, 2010). HCB chronic oral reference dose is 0.0005 mg/kg-day taken from Health Canada, 2009.

1.6 METHOXYCHLOR

1. Constituent Properties

A. Physical and Chemical Properties

Atomic Weight (g/mol):	345.65
Melting Point (°C):	89
Boiling Point (°C):	no data located
Specific Density:	1.41 (@ 25°C)
Water Solubility (mg/L):	0.045
Vapor Pressure (mm Hg):	1.4E-06 (@ 25°C)
Henry's Law Constant ($atm\text{-}m^3/mol$):	1.6E-05 (@ 25°C)

Reference: ATSDR, 2002d. Toxicological Profile for Methoxychlor.

B. Chemical Transformation

Air: Methoxychlor will adhere to particulates in the atmosphere and is subject to wet and dry deposition (ATSDR, 2002d).

Water: Methoxychlor may be degraded in water by chemical, photochemical, and biological processes. Methoxychlor undergoes spontaneous elimination reaction to yield dehydrochlorinated products (ATSDR, 2002d).

Soil: Methoxychlor in soils can be biodegraded under aerobic and anaerobic conditions. Biodegradation of methoxychlor has been reported to be stronger under anaerobic conditions than aerobic conditions (ATSDR, 2002d).

2. Toxicological Properties

A. Metabolism

Methoxychlor is rapidly metabolized to estrogenic compounds in animals and humans by hepatic enzymes. Most of the metabolites of methoxychlor leave the body within 24 hours, primarily in the feces, with lesser amounts in urine. Some methoxychlor can enter the fat of the body but does not accumulate in the fat (ATSDR, 2002d).

B. Acute Toxicity

Animal studies suggest that exposure to large amounts of methoxychlor can produce neurological effects, including apprehension, nervousness, increased salivation, decreased locomotor activity, tremors, convulsions, and death. Methoxychlor has been reported to be a neurotoxicant even in the absence of metabolism (ATSDR, 2002d.

C. Subacute and Chronic Toxicity

Animal studies reported changes in the liver and the kidneys, as well as weight loss, after large doses of methoxychlor. Observable changes in the liver included alter weight, altered enzyme and protein levels, pale and mottled appearance and changes in the kidneys included cystic tubular nephropathy and elevated blood urea nitrogen (BUN) (ATSDR, 2002d).

D. Carcinogenicity

A number of chronic dietary studies have been done to test the carcinogenicity of methoxychlor in rats and mice, in addition, two limited studies using mice have been performed by subcutaneous administration and skin application. All of the chronic studies were reviewed, reevaluating raw data and the histological sections when possible. Most of the experimental evidence does not support the contention that methoxychlor is a carcinogen. USEPA has suggested that the differences in the conclusions may be due in part to the difficulty in distinguishing between regenerative hyperplasia, hyperplastic nodules, benign neoplasia, and malignant neoplasia, as well as the use of inappropriate control data in some of the statistical analyses. USEPA classifies methoxychlor as Group D, not classified as to human carcinogenicity based on human data are unavailable, and animal evidence is inconclusive (USEPA, 1993b). IARC has classified methoxychlor in Group 3 as an agent that is not classifiable as to its carcinogenicity to humans (IARC, 2010).

E. Mutagenicity

In mutagenicity assays, negative results were obtained (with or without metabolic activation) in bacteria, yeast, in assays of methoxychlor-induced DNA damage, or in assays of unscheduled DNA synthesis in mammalian cell cultures. A weakly positive increase was

observed in a transformation study using BALB/3T3 cell line (USEPA, 1993b).

F. Teratogenicity/Reproductive Effects

In animal studies, signs of fetotoxicity were reported following exposure to methoxychlor *in utero*. These included decreased fetal body weight, increased incidence of wavy ribs, resorption, and death. Animal studies have reported that exposure to methoxychlor adversely affects the ovaries, uterus, and mating cycle in females, and the testes and prostate in males. Fertility is decreased in both female and male animals. These effects can occur in adult animals and in developing animals exposed prenatally or shortly after birth (ATSDR, 2002d).

G. Other Health Effects

No data available.

H. Epidemiological Evidence

A single epidemiogical study was located which identified an association between methoxychlor exposure and leukemia in farmers, however, it was determined that a definite conclusion could not be determine due to the limited study (ATSDR, 2002d).

I. Toxicity Data

The chronic oral reference dose for methoxychlor is 0.1 mg/kg-day as reported by Health Canada, 2009.

1.7 MIREX

1. Constituent Properties

A. Physical and Chemical Properties

Atomic Weight (g/mol):	545.59
Melting Point (°C):	584
Boiling Point (°C):	no data
Specific Density:	no data
Water Solubility (mg/L):	0.6
Vapor Pressure (mm Hg):	3.0E-07
Henry's Law Constant (atm-m^3/mol):	5.16E-04 (@ 22°C)

Reference: ATSDR, 1995. Toxicological Profile for Mirex.

B. Chemical Transformation

Air: Mirex is a very hydrophobic compound with a low vapor pressure, therefore atmospheric transport is unlikely. Based on the vapor pressure, mirex is expected to exist mainly in the particulate phase with a small proportion existing in the vapor phase in the ambient atmosphere (ATSDR, 1995).

Water: Given the lipophilic nature of this compound (high octanol-water partition coefficient), mirex is both bioaccumulated and biomagnified in aquatic and terrestrial food chains. Mirex is a very persistent compound in the environment and is highly resistant to both chemical and biological degradation. The primary process for the degradation of mirex is photolysis in water (ATSDR, 1995).

Soil: The primary process for the degradation of mirex is photolysis on soil surfaces; photomirex is the major transformation product of photolysis. In soil or sediments, anaerobic biodegradation is also a major removal mechanism whereby mirex is slowly dechlorinated to the lo-monohydro derivative. Aerobic biodegradation on soil is a very slow and minor degradation process (ATSDR, 1995).

2. Toxicological Properties

A. Metabolism

Mirex is a highly stable, lipophilic compound that is resistant to metabolism. It has a high lipid:water partition coefficient, so it partitions readily to fat and demonstrates a very high potential for accumulation in tissues (ASTDR, 1995).

B. Acute Toxicity

The main targets of mirex toxicity following acute exposure by the oral route are the liver, nervous system, developing fetus, and eyes. Impaired hepatobiliary excretion and hepatic glycogen depletion have been described as the major hepatic effects. Tremors, hyperactivity or lethargy, and weakness were observed following acute-duration oral exposure to large doses of mirex. Diarrhea (resulting from gastric irritation) has also been found with acute-duration oral mirex administration, especially in dying animals; however, the dose at which this effect occurs is not clear (ATSDR, 1995).

C. Subacute and Chronic Toxicity

The major target organs for mirex after chronic-duration exposures appear to be the kidney, nervous system, reproductive system, liver, cardiovascular system, and thyroid. Although acute- and intermediate-duration exposures to mirex are without renal effects, chronic-duration exposure results in kidney toxicity. Sufficient data exist to speculate that the kidney is a primary site of mirex toxicity. Nephrotoxicity as characterized by histological changes (necrosis, nephritis) has been documented (ATSDR, 1995).

D. Carcinogenicity

Dietary studies have been done to test the carcinogenicity of mirex in animals reporting liver and thyroid lesions (ATSDR, 1995; USEPA 1992), however, USEPA has not classified mirex to it's carcinogenicity.

However, IARC has classified mirex in Group 2B as an agent that is possibly carcinogenic to humans (IARC, 2010).

E. Mutagenicity

Although mirex has been extensively evaluated in *in vivo* or *in vitro* genetic toxicology test systems, the existing studies provide convincing evidence that this compound is genotoxic. Mirex was negative in microbial and mammalian cell gene mutation assays, and showed no signs of clastogenesis in male rats in well-conducted dominant lethal assays (ATSDR, 1995).

F. Teratogenicity/Reproductive Effects

Oral administration of mirex decreased the fertility or fecundity and litter size, reduced the sperm count, and caused testicular atrophy in animals (ATSDR, 1995; USEPA, 1992). Several animal studies reported developmental effects to include cataracts, increase in fetal mortality, liver and thyroid abnormalities in pups (ATSDR, 1995; USEPA, 1992).

G. Other Health Effects

Thyroid toxicity has also been documented in rats, in addition to adrenal hypertrophy and hyperfunction (ATSDR, 1995).

H. Epidemiological Evidence

There are no epidemiological or case reports of mirex-exposed individuals.

I. Toxicity Data

The chronic oral reference dose for methoxychlor is 0.0002 mg/kg-day as reported by USEPA, 2010.

1.8 TRANS-NONACHLOR

1. Constituent Properties

A. Physical and Chemical Properties

Atomic Weight (g/mol):	444.23
Melting Point (°C):	no data
Boiling Point (°C):	no data
Specific Density:	no data
Water Solubility (mg/L):	0.0082
Vapor Pressure (mm Hg):	no data
Henry's Law Constant (atm-m^3/mol):	2.5E-05

Reference: Hazardous Substances Databank (HSDB), 2011.

B. Chemical Transformation

Air: Nonachlor will exist in both the vapor and particulate phases in the ambient atmosphere. Vapor-phase nonachlor is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 23 hours. Particulate-phase nonachlor may be removed from the air by wet and dry deposition. A photolysis study demonstrated that nonachlor will decompose on exposure to artificial light; the results indicate that nonachlor will be susceptible to direct photolysis in the environmental UV spectrum(HSDB, 2011).

Water: Nonachlor is expected to adsorb to suspended solids and sediment when in the water column. Volatilization from water surfaces is expected to be an important fate process based upon this compound's Henry's Law constant. (HSDB, 2011).

Soil: Nonachlor is expected to be immobile in soil. Volatilization of nonachlor from moist soil surfaces is expected but not from dry soil surfaces (HSDB, 2011).

2. Toxicological Properties

A. Metabolism

Trans-nonachlor, one of the major constituents of technical chlordane, is an important compound, since it is known to accumulate in humans. The chief route of excretion for nonachlor is biliary, although nearly all organochlorines yield measurable urinary metabolites. Many of the unmetabolized pesticides are efficiently reabsorbed by the intestine (enterohepatic circulation) substantially retarding fecal excretion. Animal studies results indicate that subchronic trans-nonachlor exposure in rats induced hepatic changes with far-reaching metabolic and endocrine effects. Differences in target organ responses in male and female rats indicate that the sex-related metabolic differences affect trans-nonachlor bioaccumulation and elimination (HSDB, 2011).

B. Acute Toxicity

The chief acute toxic action of nonachlor (organochlorine pesticide) reported in animal studies is on the central nervous system (CNS). Symptoms of acute poisoning result from stimulation of CNS and include headache, blurred vision, dizziness, slight involuntary muscular movements, sweating, insomnia, bad dreams, nausea, and general malaise. More severe illness is characterized by jerking of muscles or groups of muscles and epileptiform convulsions, with loss of consciousness, involuntary incontinence of urine and feces, disorientation, personality changes, psychic disturbances, and loss of memory. When tissue organochlorine concentrations drop below threshold levels, recovery from the poisoning occurs (HSDB, 2011).

C. Subacute and Chronic Toxicity

Chronic exposure to nonachlor resulted in increased liver weight and histopathological changes consistent with microsomal enzyme induction. Hepatic changes were most pronounced in rats treated with trans-nonachlor. Elevated kidney weights and depressed organic ion transport were observed in males treated with trans-nonachlor (HSDB, 2011).

D. Carcinogenicity

USEPA has not evaluated trans-nonachlor for it's carcinogenicity. IARC has not classified trans-nonachlor with respect to carcinogenicity to humans (IARC, 2010).

E. Mutagenicity

No information available.

F. Teratogenicity/Reproductive Effects

No Information available.

G. Other Health Effects

Anorexia and weight loss as well as severe gastroenteritis has been described in one of the fatal human poisonings (HSDB, 2011).

H. Epidemiological Evidence

No Information available.

I. Toxicity Data

No toxicity data available for this compound.

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