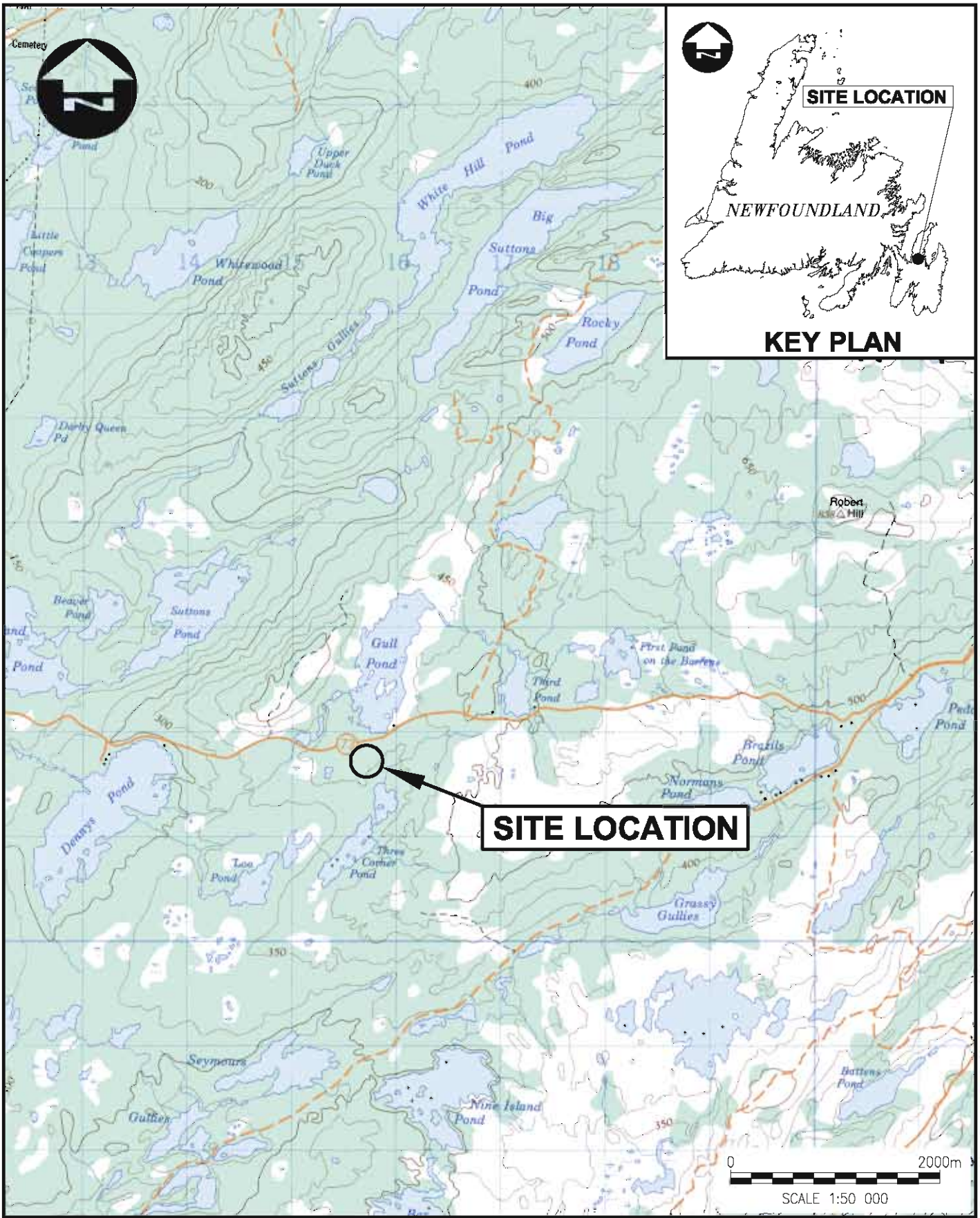
APPENDIX A
FIGURES



DILLON CONSULTING	PROJECT: HHERA FOR THE PCB AREA, UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE	PROJECT NO.: 13-7515
DATE: JULY 2013	TITLE: SITE LOCATION PLAN	FIGURE NO.: 1

FileName: g:\cad\55 st. john's\137515\00-general\03-reports\july 2013\137515-00-site-fig1.dwg

N

Suttons Pond

Third Pond

RESIDENTIAL AREA

SEASONAL CABINS

ROUTE 73

WASTE DISPOSAL SITE

Dennys Pond

Three Corner Pond

Loo Pond

0 200 400m

Approximate Scale 1:10,000

FileName: g:\cad\55 st. john's\137515\00-general\03-reports\july 2013\137515-00-site-fig2.dwg

DILLON CONSULTING

DATE JULY 2013

PROJECT
HHERA FOR THE PCB AREA, UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

PROJECT NO.
13-7515

TITLE
SITE AND SURROUNDING AREA

FIGURE NO.
2

ROUTE 73

LOCKED GATED ENTRANCE

MW-07

ACCESS ROAD

BURIED WASTE

MW-02

MW-01

APPROXIMATE EXTENT OF PCB DISPOSAL AREA

BURIED WASTE

SAWDUST AREA

ACCESS ROAD TO LEACHATE POND

TOP OF SLOPE

TOE OF SLOPE

MW-04

MW-06

INTERCEPTION DITCH (TYP.)

Unnammed Pond

LEACHATE POND

LAYDOWN AREA

LEGEND:

- Test Pit Location
- Monitor Well Location

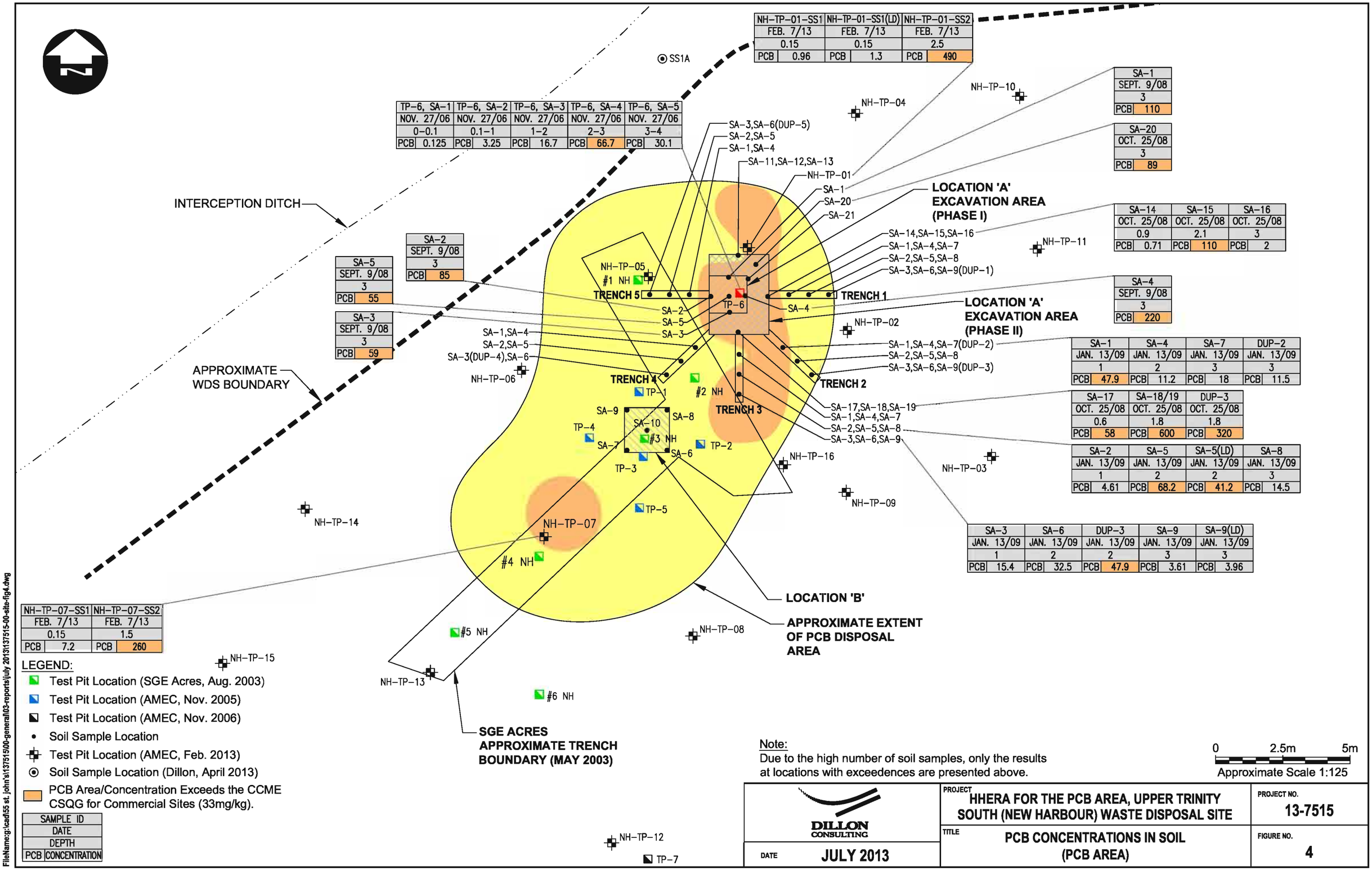
SOURCE:
SNC-LAVALIN Monitoring Well and Surface Water Sample Location with Parameter Exceedances (Figure 4), Project No. 508907-0001 (March 2012), AMEC PCB in Soil Sample Location Plan (Figure 3), Project No. TF1312736 (February 2013) and Google Earth Pro Image (2004).

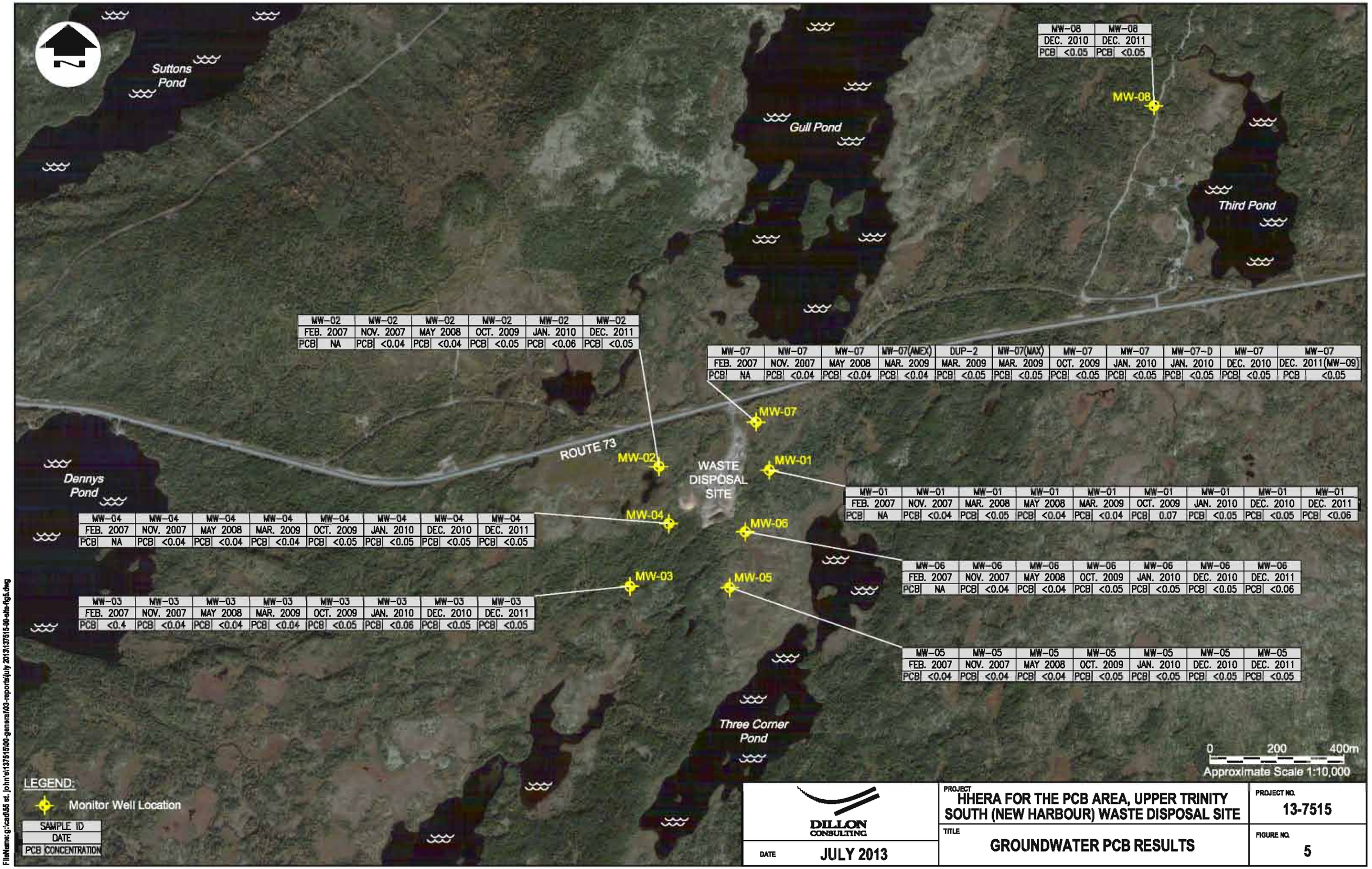
0 40 80m

Approximate Scale 1:2000

FileName: g:\cad\55 st. john's\137515\500-general\03-reports\july 2013\137515-00-site-fig3.dwg

DILLON CONSULTING	PROJECT: HHERA FOR THE PCB AREA, UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE	PROJECT NO.: 13-7515
DATE: JULY 2013	TITLE: SITE PLAN	FIGURE NO.: 3


NH-TP-01-SS1 | NH-TP-01-SS1(LD) | NH-TP-01-SS2
FEB. 7/13 | FEB. 7/13 | FEB. 7/13
0.15 | 0.15 | 2.5
PCB 0.96 | PCB 1.3 | PCB 490
SS1A
TP-6, SA-1 | TP-6, SA-2 | TP-6, SA-3 | TP-6, SA-4 | TP-6, SA-5
NOV. 27/06 | NOV. 27/06 | NOV. 27/06 | NOV. 27/06 | NOV. 27/06
0-0.1 | 0.1-1 | 1-2 | 2-3 | 3-4
PCB 0.125 | PCB 3.25 | PCB 16.7 | PCB 66.7 | PCB 30.1
SA-1 | SEPT. 9/08 | 3 | PCB 110
SA-20 | OCT. 25/08 | 3 | PCB 89
SA-14 | SA-15 | SA-16
OCT. 25/08 | OCT. 25/08 | OCT. 25/08
0.9 | 2.1 | 3
PCB 0.71 | PCB 110 | PCB 2
SA-4 | SEPT. 9/08 | 3 | PCB 220
SA-1 | SA-4 | SA-7 | DUP-2
JAN. 13/09 | JAN. 13/09 | JAN. 13/09 | JAN. 13/09
1 | 2 | 3 | 3
PCB 47.9 | PCB 11.2 | PCB 18 | PCB 11.5
SA-17 | SA-18/19 | DUP-3
OCT. 25/08 | OCT. 25/08 | OCT. 25/08
0.6 | 1.8 | 1.8
PCB 58 | PCB 600 | PCB 320
SA-2 | SA-5 | SA-5(LD) | SA-8
JAN. 13/09 | JAN. 13/09 | JAN. 13/09 | JAN. 13/09
1 | 2 | 2 | 3
PCB 4.61 | PCB 68.2 | PCB 41.2 | PCB 14.5
SA-3 | SA-6 | DUP-3 | SA-9 | SA-9(LD)
JAN. 13/09 | JAN. 13/09 | JAN. 13/09 | JAN. 13/09 | JAN. 13/09
1 | 2 | 2 | 3 | 3
PCB 15.4 | PCB 32.5 | PCB 47.9 | PCB 3.61 | PCB 3.96
SA-2 | SEPT. 9/08 | 3 | PCB 85
SA-5 | SEPT. 9/08 | 3 | PCB 55
SA-3 | SEPT. 9/08 | 3 | PCB 59
NH-TP-07-SS1 | NH-TP-07-SS2
FEB. 7/13 | FEB. 7/13
0.15 | 1.5
PCB 7.2 | PCB 260
INTERCEPTION DITCH
APPROXIMATE WDS BOUNDARY
LOCATION 'A' EXCAVATION AREA (PHASE I)
LOCATION 'A' EXCAVATION AREA (PHASE II)
LOCATION 'B'
APPROXIMATE EXTENT OF PCB DISPOSAL AREA
SGE ACRES APPROXIMATE TRENCH BOUNDARY (MAY 2003)
TRENCH 1
TRENCH 2
TRENCH 3
TRENCH 4
TRENCH 5
NH-TP-01
NH-TP-02
NH-TP-03
NH-TP-04
NH-TP-05
NH-TP-06
NH-TP-07
NH-TP-08
NH-TP-09
NH-TP-10
NH-TP-11
NH-TP-12
NH-TP-13
NH-TP-14
NH-TP-15
NH-TP-16
TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-7
#1 NH
#2 NH
#3 NH
#4 NH
#5 NH
#6 NH
SA-1,SA-4
SA-2,SA-5
SA-3(DUP-4),SA-6
SA-3,SA-6(DUP-5)
SA-2,SA-5
SA-1,SA-4
SA-11,SA-12,SA-13
SA-1
SA-20
SA-21
SA-14,SA-15,SA-16
SA-1,SA-4,SA-7
SA-2,SA-5,SA-8
SA-3,SA-6,SA-9(DUP-1)
SA-2
SA-5
SA-3
SA-4
SA-1,SA-4,SA-7(DUP-2)
SA-2,SA-5,SA-8
SA-3,SA-6,SA-9(DUP-3)
SA-17,SA-18,SA-19
SA-1,SA-4,SA-7
SA-2,SA-5,SA-8
SA-3,SA-6,SA-9
SA-9
SA-10
SA-8
SA-7
SA-6
LEGEND:
Test Pit Location (SGE Acres, Aug. 2003)
Test Pit Location (AMEC, Nov. 2005)
Test Pit Location (AMEC, Nov. 2006)
Soil Sample Location
Test Pit Location (AMEC, Feb. 2013)
Soil Sample Location (Dillon, April 2013)
PCB Area/Concentration Exceeds the CCME CSQG for Commercial Sites (33mg/kg).
SAMPLE ID
DATE
DEPTH
PCB CONCENTRATION
Note:
Due to the high number of soil samples, only the results at locations with exceedences are presented above.
0 2.5m 5m
Approximate Scale 1:125
DILLON CONSULTING
DATE JULY 2013
PROJECT HHERA FOR THE PCB AREA, UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE
PROJECT NO. 13-7515
TITLE PCB CONCENTRATIONS IN SOIL (PCB AREA)
FIGURE NO. 4
FileName:g:\cad\55 st. john's\13751500-general\03-reports\july 2013\13751500-00-site-fig4.dwg



MW-08	MW-08
DEC. 2010	DEC. 2011
PCB <0.05	PCB <0.05

MW-02	MW-02	MW-02	MW-02	MW-02	MW-02
FEB. 2007	NOV. 2007	MAY 2008	OCT. 2009	JAN. 2010	DEC. 2011
PCB NA	PCB <0.04	PCB <0.04	PCB <0.05	PCB <0.06	PCB <0.05

MW-07	MW-07	MW-07	MW-07(AMEX)	DUP-2	MW-07(MAX)	MW-07	MW-07	MW-07-D	MW-07	MW-07
FEB. 2007	NOV. 2007	MAY 2008	MAR. 2009	MAR. 2009	MAR. 2009	OCT. 2009	JAN. 2010	JAN. 2010	DEC. 2010	DEC. 2011(MW-09)
PCB NA	PCB <0.04	PCB <0.04	PCB <0.04	PCB <0.05	PCB <0.05	PCB <0.05	PCB <0.05	PCB <0.05	PCB <0.05	PCB <0.05

MW-01	MW-01	MW-01	MW-01	MW-01	MW-01	MW-01	MW-01	MW-01
FEB. 2007	NOV. 2007	MAR. 2008	MAY 2008	MAR. 2009	OCT. 2009	JAN. 2010	DEC. 2010	DEC. 2011
PCB NA	PCB <0.04	PCB <0.05	PCB <0.04	PCB <0.04	PCB 0.07	PCB <0.05	PCB <0.05	PCB <0.06

MW-04	MW-04	MW-04	MW-04	MW-04	MW-04	MW-04	MW-04
FEB. 2007	NOV. 2007	MAY 2008	MAR. 2009	OCT. 2009	JAN. 2010	DEC. 2010	DEC. 2011
PCB NA	PCB <0.04	PCB <0.04	PCB <0.04	PCB <0.05	PCB <0.05	PCB <0.05	PCB <0.05

MW-06	MW-06	MW-06	MW-06	MW-06	MW-06	MW-06
FEB. 2007	NOV. 2007	MAY 2008	OCT. 2009	JAN. 2010	DEC. 2010	DEC. 2011
PCB NA	PCB <0.04	PCB <0.04	PCB <0.05	PCB <0.05	PCB <0.05	PCB <0.06

MW-03	MW-03	MW-03	MW-03	MW-03	MW-03	MW-03	MW-03
FEB. 2007	NOV. 2007	MAY 2008	MAR. 2009	OCT. 2009	JAN. 2010	DEC. 2010	DEC. 2011
PCB <0.4	PCB <0.04	PCB <0.04	PCB <0.04	PCB <0.05	PCB <0.06	PCB <0.05	PCB <0.05

MW-05	MW-05	MW-05	MW-05	MW-05	MW-05	MW-05
FEB. 2007	NOV. 2007	MAY 2008	OCT. 2009	JAN. 2010	DEC. 2010	DEC. 2011
PCB <0.04	PCB <0.04	PCB <0.04	PCB <0.05	PCB <0.05	PCB <0.05	PCB <0.05

LEGEND:

Monitor Well Location

SAMPLE ID
DATE
PCB CONCENTRATION

DILLON CONSULTING

DATE: JULY 2013

PROJECT: HHERA FOR THE PCB AREA, UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

PROJECT NO.: 13-7515

TITLE: GROUNDWATER PCB RESULTS

FIGURE NO.: 5

FileName: g:\cad\55 st. john's\137515000-general\03-reports\july 2013\137515-00-site-fig5.dwg

N

Suttons Pond

Gull Pond

Third Pond

SED A (SW)
AUG. 2002
PCB <0.05

SED A

DITCH (SW)
MAR. 2009
PCB 0.05

ROUTE 73

DITCH (WATER SAMPLE)

WASTE DISPOSAL SITE

SW-POND

POND–SED	POND–SED
MAR. 2010	NOV. 2010
0.05	0.05
PCB <0.05	PCB <0.01

SED B (SW)
AUG. 2002
PCB <0.05

SED B

SW-STREAM

STREAM	STREAM	STREAM	STREAM	STREAM	STREAM	STREAM	STREAM
NOV. 2007	MAY 2008	MAR. 2009	MAR. 2009	SEPT. 2009	JAN. 2010	NOV. 2010	DEC. 2011
PCB <0.04	PCB <0.04	PCB <0.04	PCB <0.04	PCB <0.05	PCB <0.06	PCB <0.05	PCB <0.05

Dennys Pond

Three Corner Pond

Loo Pond

0 200 400m

Approximate Scale 1:10,000

LEGEND:

Surface Water Sample Location

SAMPLE ID
DATE
PCB CONCENTRATION

FileName: g:\cad\55 st. john's\137515\00-general\03-reports\july 2013\137515-00-site-fig6.dwg

DILLON CONSULTING

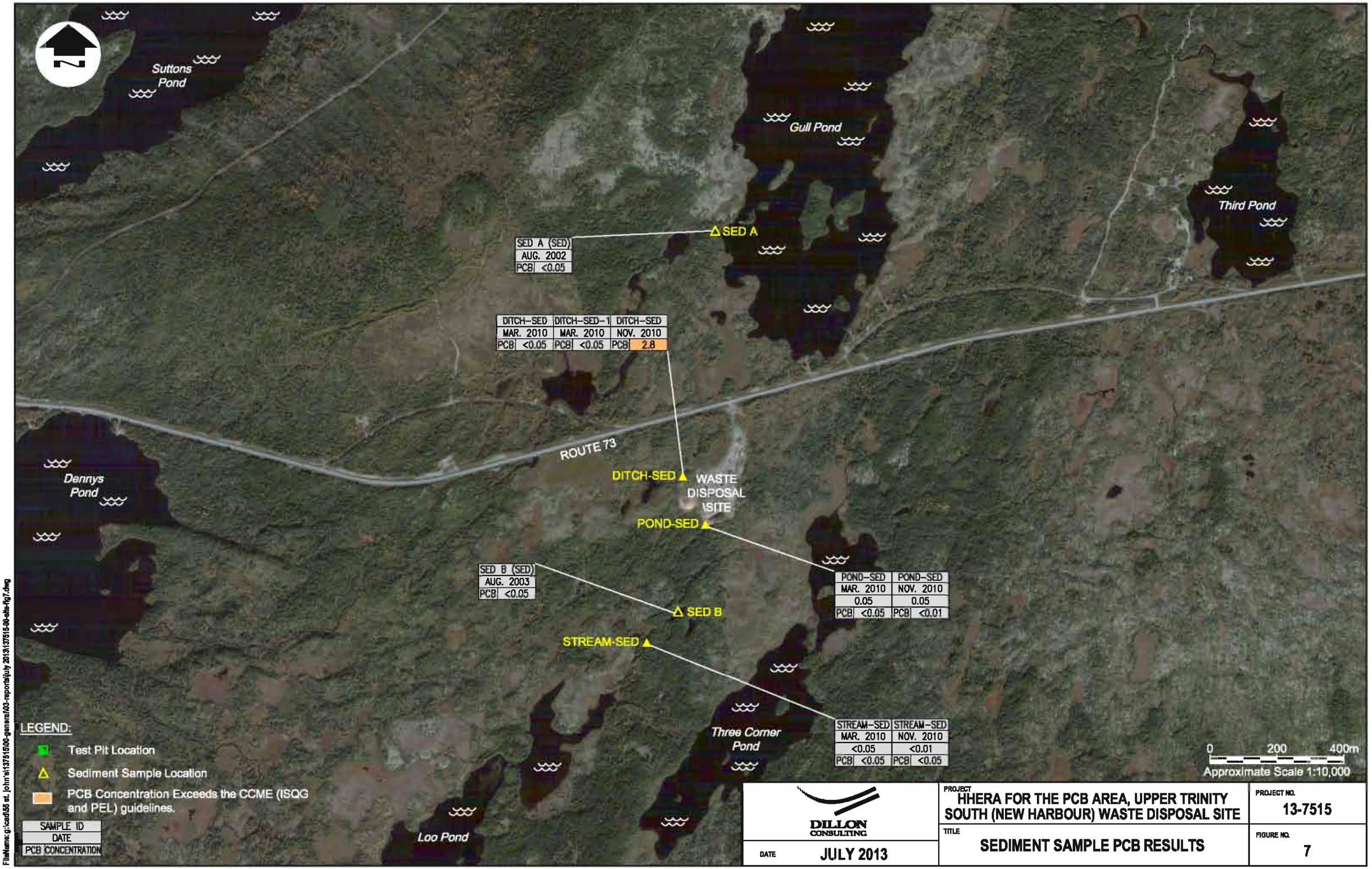
DATE JULY 2013

PROJECT
HHERA FOR THE PCB AREA, UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

PROJECT NO.
13-7515

TITLE
SURFACE WATER PCB RESULTS

FIGURE NO.
6



FileName: g:\cad\55 st. john's\137515\00-general\03-reports\july 2013\137515-00-site-fig7.dwg

DILLON CONSULTING

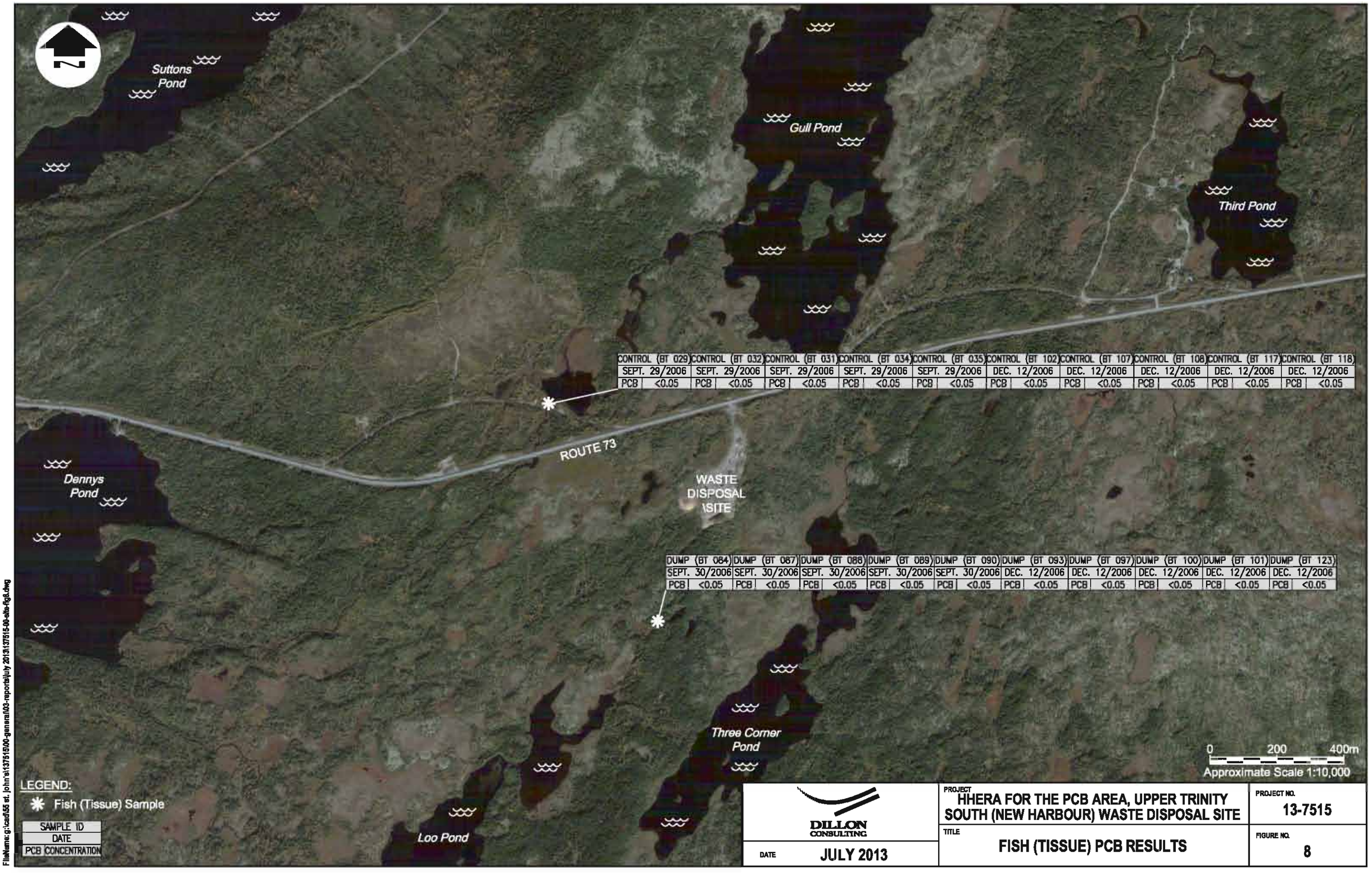
DATE JULY 2013

PROJECT HHERA FOR THE PCB AREA, UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

PROJECT NO. 13-7515

TITLE SEDIMENT SAMPLE PCB RESULTS

FIGURE NO. 7



CONTROL (BT 029)		CONTROL (BT 032)		CONTROL (BT 031)		CONTROL (BT 034)		CONTROL (BT 035)		CONTROL (BT 102)		CONTROL (BT 107)		CONTROL (BT 108)		CONTROL (BT 117)		CONTROL (BT 118)	
SEPT. 29/2006		SEPT. 29/2006		SEPT. 29/2006		SEPT. 29/2006		SEPT. 29/2006		DEC. 12/2006		DEC. 12/2006		DEC. 12/2006		DEC. 12/2006		DEC. 12/2006	
PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05

DUMP (BT 084)		DUMP (BT 087)		DUMP (BT 088)		DUMP (BT 089)		DUMP (BT 090)		DUMP (BT 093)		DUMP (BT 097)		DUMP (BT 100)		DUMP (BT 101)		DUMP (BT 123)	
SEPT. 30/2006		SEPT. 30/2006		SEPT. 30/2006		SEPT. 30/2006		SEPT. 30/2006		DEC. 12/2006		DEC. 12/2006		DEC. 12/2006		DEC. 12/2006		DEC. 12/2006	
PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05	PCB	<0.05

LEGEND:

✱ Fish (Tissue) Sample

SAMPLE ID
DATE
PCB CONCENTRATION

FileName: g:\cad\55 st. john's\13751\000-general\03-reports\july 2013\137515-00-site-fig8.dwg

DILLON CONSULTING

DATE JULY 2013

PROJECT
HHERA FOR THE PCB AREA, UPPER TRINITY SOUTH (NEW HARBOUR) WASTE DISPOSAL SITE

PROJECT NO.
13-7515

TITLE
FISH (TISSUE) PCB RESULTS

FIGURE NO.
8

APPENDIX B
PHOTOGRAPHS

1. Looking south into the WDS from the road.

2. Looking south into the WDS from the access road.

3. Looking northeast at the PCB Area and former TP locations (exposed soil).

4. Looking northwest at the PCB Area and former TP location (exposed soil).

5. Looking west at the PCB Area.

6. Looking southeast at the edge of the PCB Area.

7. Looking northeast at the interception ditch near the PCB Area.

8.Looking southeast at the leachate pond located south of the WDS.

9. Looking southeast at Three Corner Pond and the surrounding habitat.

10. View at the landscape/habitat to the south of the WDS.

11. View of the landscape/habitat to the southwest of the WDS.

12. View of the landscape/habitat (and MW-06) to the east of the WDS.

APPENDIX C
CERTIFICATE OF ANALYSIS

Your C.O.C. #: b 111339

Attention: Robert Foley
Dillon Consulting Limited
66 Kenmount Rd., Suite 203
St.John's, NL
CANADA A1B 3V7

Report Date: 2013/04/05

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B349170
Received: 2013/04/04, 09:30

Sample Matrix: Soil
Samples Received: 1

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Moisture (1)	1	N/A	2013/04/04	ATL SOP 00001	MOE Handbook 1983
PCBs in soil by GC/ECD (1,2)	1	2013/04/04	2013/04/05	ATL SOP 00106	Based on EPA8082

Remarks:

Reporting results to two significant figures at the RDL is to permit statistical evaluation and is not intended to be an indication of analytical precision.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Bedford
(2) Soils are reported on a dry weight basis unless otherwise specified.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Leonard Muise, Project Manager
Email: LMuise@maxxam.ca
Phone# (902) 420-0203 Ext:236

==========

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Total cover pages: 1

Dillon Consulting Limited

Maxxam Job #: B349170
Report Date: 2013/04/05

RESULTS OF ANALYSES OF SOIL

Maxxam ID		RB1169		
Sampling Date		2013/04/02		
COC Number		b 111339		
	Units	**SS1A(0.3-0.8)**	**RDL**	**QC Batch**
Inorganics				
Moisture	%	15	1	3170660

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax:709-754-8612 www.maxxam.ca

Dillon Consulting Limited

Maxxam Job #: B349170
Report Date: 2013/04/05

POLYCHLORINATED BIPHENYLS BY GC-ECD (SOIL)

Maxxam ID		RB1169	RB1169		
Sampling Date		2013/04/02	2013/04/02		
COC Number		b 111339	b 111339		
	Units	**SS1A(0.3-0.8)**	**SS1A(0.3-0.8) Lab-Dup**	**RDL**	**QC Batch**
PCBs					
Total PCB	ug/g	ND	ND	0.050	3170764
Surrogate Recovery (%)					
Decachlorobiphenyl	%	87	84		3170764

ND = Not detected
RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax:709-754-8612 www.maxxam.ca

Dillon Consulting Limited

Maxxam Job #: B349170
Report Date: 2013/04/05

Package 1	8.2°C

Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 49-55 Elizabeth Ave, Suite 101A, St.John's, NL, Canada A1A 1W9 Tel: 709-754-0203 Toll Free: 888-492-7227 Fax:709-754-8612 www.maxxam.ca

Dillon Consulting Limited
Attention: Robert Foley
Client Project #:
P.O. #:
Site Location:

Quality Assurance Report

Maxxam Job Number: ZB349170

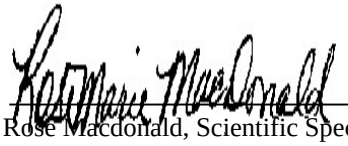
QA/QC Batch Num	Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
3170764	KJO	Matrix Spike						
		[RB1169-01]	Decachlorobiphenyl	2013/04/05		88	%	30 - 130
			Total PCB	2013/04/05		104	%	70 - 130
		Spiked Blank	Decachlorobiphenyl	2013/04/05		93	%	30 - 130
			Total PCB	2013/04/05		108	%	70 - 130
		Method Blank	Decachlorobiphenyl	2013/04/05		91	%	30 - 130
			Total PCB	2013/04/05	ND, RDL=0.050		ug/g	
		RPD [RB1169-01]	Total PCB	2013/04/05	NC		%	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.
Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.
Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.
NC (RPD): The RPD was not calculated. The level of analyte detected in the parent sample and its duplicate was not sufficiently significant to permit a reliable calculation.

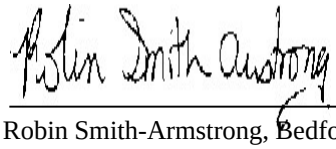
Validation Signature Page

Maxxam Job #: B349170

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Rose Macdonald, Scientific Specialist (Organics)



Robin Smith-Armstrong, Bedford SemiVol Spvsr

==========

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APPENDIX D
HISTORICAL ANALYTICAL DATA

TABLE 1
PCB CONCENTRATIONS IN SOIL
Human and Ecolgical Risk Assessment, PCB Area
Upper Trinity South (New Harbour) Waste Disposal Site, Newfoundland and Labrador

Field ID	Location	Sample Depth (m)	Sampling Date (M/D/Y)	PCB Concentration (mg/kg)
Environmental Testing (Final Report), SGE Acres, February 2003				
TP-1	WDS	1.2[1]	8/30/2002	<0.05
TP-2	WDS	0.5[1]	8/30/2002	<0.05
TP-3	WDS	3.4[1]	8/30/2002	<0.05
TP-4	WDS	1.2[1]	8/30/2002	<0.05
TP-5	Near PCB Area	2.4[1]	8/30/2002	<0.05
TP-6	Near PCB Area	1.0[1]	8/30/2002	<0.05
Part I, Phase I, Environmental Testing (Final Report), May 2003				
# 1 NH	PCB Disposal Area	Bedrock	21/2/2003	<1
# 2 NH	PCB Disposal Area	Bedrock	21/2/2003	<1
# 3 NH	PCB Disposal Area	Bedrock	21/2/2003	**52**
# 4 NH	PCB Disposal Area	Bedrock	21/2/2003	<1
# 5 NH	PCB Disposal Area	Bedrock	21/2/2003	<1
# 6 NH	PCB Disposal Area	Bedrock	21/2/2003	<1
Test #1	Near Transformers	-	21/2/2003	5.7[2]
Test #2	Near Transformers	-	21/2/2003	1.4[2]
Design of Leachate Control System, AMEC, June 2006				
TP1-1	SGE Excavation Boundry	0.0-1.0	11/4/2005	1.42
TP1-2	SGE Excavation Boundry	1.0-2.0	11/4/2005	3.38
TP1-3	SGE Excavation Boundry	2.0-3.0	11/4/2005	2.53
TP2-1	SGE Excavation Boundry	0.0-1.0	11/4/2005	21.1
TP2-2	SGE Excavation Boundry	1.0-2.0	11/4/2005	1.80
TP2.5	SGE Excavation Boundry	2.0-2.5	11/4/2005	0.043 (0.036)
TP3-1	SGE Excavation Boundry	0.0-1.0	11/4/2005	8.49
TP3-2	SGE Excavation Boundry	1.0-2.0	11/4/2005	7.99
TP3-3	SGE Excavation Boundry	2.0-3.0	11/4/2005	5.31
TP4-1	SGE Excavation Boundry	0.0-1.0	11/4/2005	2.16
TP4-2	SGE Excavation Boundry	1.0-2.0	11/4/2005	2.39
TP4-3	SGE Excavation Boundry	2.0-3.0	11/4/2005	1.63
TP5-1	SGE Excavation Boundry	0.0-1.0	11/4/2005	2.37
TP5-2	SGE Excavation Boundry	1.0-2.0	11/4/2005	4.79
TP5-3	SGE Excavation Boundry	2.0-3.0	11/4/2005	1.40
Implementation of the Leachate Control System, AMEC, March 2007				
TP-6, SA-1	Location A	0.0-0.1	11/27/2006	0.125
TP-6, SA-2	Location A	0.1-1.0	11/27/2006	3.25
TP-6, SA-3	Location A	1.0-2.0	11/27/2006	16.7
TP-6, SA-4	Location A	2.0-3.0	11/27/2006	**66.7**
TP-6, SA-5	Location A	3.0-4.0	11/27/2006	30.1
TP7, SA-1	PCB Disposal Area	0.0-0.1	11/27/2006	0.052
TP7, SA-2	PCB Disposal Area	0.1-1.0	11/27/2006	2.34
TP7, SA-3	PCB Disposal Area	1.0-2.0	11/27/2006	0.125
TP7, SA-4	PCB Disposal Area	2.0-3.0	11/27/2006	0.222
TP7, SA-5	PCB Disposal Area	3.0-3.5	11/27/2006	0.264 (0.273)
CCME Guideline				
Canadian Soil Quality Guideline (Commercial)				33

Notes:
<0.05: below the reported detection limit of 0.05 mg/kg
Brackets indicate duplicate sample (DUP=field duplicate; LD=laboratory duplicate)
Soil at this location was excavated and disposed off-site
The remaining soils are considered to be representative of current soil quality
PCB concentration exceeds the CCME soil quality guideline (SQG) for industrial sites (33 mg/kg)
Imported fill not included in risk assessment calculations
[1]Depth indicates test pit depth. The report did not indicate at what depth the soil samples were taken.
[2]Two soil samples were taken in the immediate vicinity of the transformers to determine whether there had been any PCB soils in the transformers prior to burial (SGE, May 2003).
- : unknown

TABLE 1
PCB CONCENTRATIONS IN SOIL
Human and Ecolgical Risk Assessment, PCB Area
Upper Trinity South (New Harbour) Waste Disposal Site, Newfoundland and Labrador

Field ID	Location	Sample Depth (m)	Sampling Date (M/D/Y)	PCB Concentration (mg/kg)
Annual Report of Activities, AMEC, March 2009 - Phase I				
SA-1	Location A	3.0	9/9/2008	**110**
SA-2	Location A	3.0	9/9/2008	**85**
SA-3	Location A	3.0	9/9/2008	**59**
SA-4	Location A	3.0	9/9/2008	**220**
SA-5	Location A	3.0	9/9/2008	**55**
Stockpile 1	Location A	-	9/9/2008	**150**
SA-6	Location B	3.0	9/9/2008	0.93
SA-7	Location B	3.0	9/9/2008	15
SA-8	Location B	3.0	9/9/2008	7.3
SA-9	Location B	3.0	9/9/2008	7.5
DUP-1 (SA-9)	Location B	3.0	9/9/2008	14
SA-10	Location B	3.0	9/9/2008	0.64
Stockpile 2	Location B	3.0	9/9/2008	0.83
SA-11	Location A	0.8	10/25/2008	9.8
SA-12/13	Location A	1.8	10/25/2008	28
DUP-2 (SA-12/13)	Location A	1.8	10/25/2008	20
SA-14	Location A	0.9	10/25/2008	0.71
SA-15	Location A	2.1	10/25/2008	**110**
SA-16	Location A	3.0	10/25/2008	2
SA-17	Location A	0.6	10/25/2008	**58**
SA-18/19	Location A	1.8	10/25/2008	**600**
DUP-3 (SA-18/19)	Location A	1.8	10/25/2008	**320**
SA20	Location A	3.0	10/25/2008	**89**
OVERBURDEN-1	Location A	NA	10/28/2008	10
OVERBURDEN-2	Location A	NA	10/28/2008	6.6
STOCKPILE-1, SA-2	Location A	NA	10/28/2008	**110**
Annual Report of Activities, AMEC, March 2009 - Phase II				
Trench 1, SA-1	Location A	1.0	1/12/2009	0.9
Trench 1, SA-2	Location A	1.0	1/12/2009	6.06
Trench 1, SA-3	Location A	1.0	1/12/2009	0.064
Trench 1, SA-4	Location A	2.0	1/12/2009	0.418
Trench 1, SA-5	Location A	2.0	1/12/2009	2.44
Trench 1, SA-6	Location A	2.0	1/12/2009	0.97
SA-6 (LD)	Location A	2.0	1/12/2009	1.03
Trench 1, SA-7	Location A	3.0	1/12/2009	0.304
Trench 1, SA-8	Location A	3.0	1/12/2009	0.87
Trench 1, SA-9	Location A	3.0	1/12/2009	0.83
DUP-1 (SA-9)	Location A	3.0	1/12/2009	1.29
Trench 1, SA-1	Location A	1.0	1/12/2009	**47.9**
Trench 1, SA-2	Location A	1.0	1/13/2009	5.95
Trench 1, SA-3	Location A	1.0	1/13/2009	1.54
CCME Guideline				
Canadian Soil Quality Guideline (Commercial)				33

<0.05: below the reported detection limit of 0.05 mg/kg
Brackets indicate duplicate sample (DUP=field duplicate; LD=laboratory duplicate)
Soil at this location was excavated and disposed off-site
PCB concentration exceeds the CCME Soil Quality Guideline for industrial sites (33 mg/kg)
Imported fill not included in risk assessment calculations
[1]Two soil samples were taken in the immediate vicinity of the transformers to determine whether there had been any PCB soils in the transformers prior to burial (SGE, May 2003).
- : unknown

TABLE 1
PCB CONCENTRATIONS IN SOIL
Human and Ecolgical Risk Assessment, PCB Area
Upper Trinity South (New Harbour) Waste Disposal Site, Newfoundland and Labrador

Field ID	Location	Sample Depth (m)	Sampling Date (M/D/Y)	PCB Concentration (mg/kg)
Annual Report of Activities, AMEC, March 2009 - Phase II				
Trench 2, SA-4	Location A	2.0	1/13/2009	11.2
Trench 2, SA-5	Location A	2.0	1/13/2009	9.22
Trench 2, SA-6	Location A	2.0	1/13/2009	6.13
Trench 2, SA-7	Location A	3.0	1/13/2009	18
DUP-2 (SA-7)	Location A	3.0	1/13/2009	11.5
Trench 2, SA-8	Location A	3.0	1/13/2009	0.553
Trench 2, SA-9	Location A	3.0	1/13/2009	0.302
Trench 3, SA-1	Location A	1.0	1/13/2009	3.21
Trench 3, SA-2	Location A	1.0	1/13/2009	4.61
Trench 3, SA-3	Location A	1.0	1/13/2009	15.4
Trench 3, SA-4	Location A	2.0	1/13/2009	26
Trench 3, SA-5	Location A	2.0	1/13/2009	**68.2**
Trench 3, SA-5 (LD)	Location A	2.0	1/13/2009	41.2
Trench 3, SA-6	Location A	2.0	1/13/2009	32.5
DUP-3 (SA-6)	Location A	2.0	1/13/2009	**47.9**
Trench 3, SA-7	Location A	3.0	1/13/2009	11.1
Trench 3, SA-8	Location A	3.0	1/13/2009	14.5
Trench 3, SA-9	Location A	3.0	1/13/2009	3.61
Trench 3, SA-9 (LD)	Location A	3.0	1/13/2009	3.96
Trench 4, SA-1	Location A	1.0	1/13/2009	3.66
Trench 4, SA-2	Location A	1.0	1/13/2009	0.85
Trench 4, SA-3	Location A	1.0	1/13/2009	0.288
DUP-4 (SA-3)	Location A	1.0	1/13/2009	0.53
DUP-4 (SA-3) (LD)	Location A	1.0	1/13/2009	0.513
Trench 4, SA-4	Location A	2.0	1/13/2009	5.76
Trench 4, SA-5	Location A	2.0	1/13/2009	3.79
Trench 4, SA-6	Location A	2.0	1/13/2009	1.17
Trench 5, SA-1	Location A	1.0	1/13/2009	13.8
Trench 5, SA-2	Location A	1.0	1/13/2009	18.2
SA-2 (LD)	Location A	1.0	1/13/2009	21
Trench 5, SA-3	Location A	1.0	1/13/2009	1.64
Trench 5, SA-4	Location A	2.0	1/13/2009	21.5
Trench 5, SA-5	Location A	2.0	1/13/2009	0.47
Trench 5, SA-6	Location A	2.0	1/13/2009	4.35
DUP-5 (SA-6)	Location A	2.0	1/13/2009	5.58
Annual Report of Activities, AMEC, March 2011				
FILL-1 (imported fill)	Location A	-	12/2/2010	<0.05
2011-2012 Annual Report of Activities, SNC, 2012				
DITCH-SED	Interceptor Ditch	0.05	Nov. 2010	2.8
CCME Guideline				
Canadian Soil Quality Guideline (Commercial)				33

Notes:
<0.05: below the reported detection limit of 0.05 mg/kg
Brackets indicate duplicate sample (DUP=field duplicate; LD=laboratory duplicate)
Soil at this location was excavated and disposed off-site
PCB concentration exceeds the CCME soil quality guideline for industrial sites (33 mg/kg)
Imported fill not included in risk assessment calculations
[1]Two soil samples were taken in the immediate vicinity of the transformers to determine whether there had been any PCB soils in the transformers prior to burial (SGE, May 2003).
- : unknown

TABLE 1
PCB CONCENTRATIONS IN SOIL
Human and Ecolgical Risk Assessment, PCB Area
Upper Trinity South (New Harbour) Waste Disposal Site, Newfoundland and Labrador

Field ID	Location	Sample Depth (m)	Sampling Date (M/D/Y)	PCB Concentration (mg/kg)
Test Pitting and Soil Sampling Program, AMEC, 2013				
NH-TP-01-SS1	PCB Disposal Area	0.15	2/7/2013	0.96
NH-TP-01-SS1 (LD)	PCB Disposal Area	0.15	2/7/2013	1.3
NH-TP-01-SS2	PCB Disposal Area	2.5	2/7/2013	**490**
NH-TP-02-SS1	PCB Disposal Area	0.4	2/7/2013	0.17
NH-TP-02-SS2	PCB Disposal Area	2.5	2/7/2013	<0.05
NH-TP-03-SS1	PCB Disposal Area	0.5	2/7/2013	<0.05
NH-TP-03-SS2	PCB Disposal Area	3.5	2/7/2013	1.5
NH-TP-04-SS1	PCB Disposal Area	0.9	2/7/2013	<0.05
NH-TP-04-SS2	PCB Disposal Area	3.0	2/7/2013	<0.05
NH-TP-DUP1 (NH-TP-04-SS2)	PCB Disposal Area	3.0	2/7/2013	<0.05
NH-TP-05-SS1	PCB Disposal Area	0.15	2/7/2013	5
NH-TP-05-SS2	PCB Disposal Area	3.0	2/7/2013	1.4
NH-TP-06-SS1	PCB Disposal Area	0.15	2/7/2013	1.5
NH-TP-06-SS2	PCB Disposal Area	3.4	2/7/2013	0.52
NH-TP-07-SS1	PCB Disposal Area	0.15	2/7/2013	7.2
NH-TP-07-SS2	PCB Disposal Area	1.5	2/7/2013	**260**
NH-TP-08-SS1	PCB Disposal Area	0.15	2/7/2013	0.77
NH-TP-08-SS2	PCB Disposal Area	3.2	2/7/2013	<0.05
NH-TP-09-SS1	PCB Disposal Area	0.8	2/7/2013	0.29
NH-TP-09-SS2	PCB Disposal Area	3.5	2/7/2013	<0.05
NH-TP-10-SS1	PCB Disposal Area	0.15	2/8/2013	<0.05
NH-TP-10-SS2	PCB Disposal Area	2.5	2/8/2013	<0.05
NH-TP-11-SS2	PCB Disposal Area	2.2	2/8/2013	<0.05
NH-TP-DUP2 (NH-TP-11-SS2)	PCB Disposal Area	2.2	2/8/2013	<0.05
NH-TP-12-SS1	PCB Disposal Area	0.8	2/8/2013	0.92
NH-TP-12-SS2	PCB Disposal Area	3.1	2/8/2013	1.9
NH-TP-12-SS2 (LD)	PCB Disposal Area	0.8	2/8/2013	2.4
NH-TP-13-SS1	PCB Disposal Area	0.15	2/8/2013	0.77
NH-TP-13-SS2	PCB Disposal Area	1.5	2/8/2013	0.72
NH-TP-14-SS1	PCB Disposal Area	0.15	2/8/2013	<0.05
NH-TP-14-SS2	PCB Disposal Area	2.5	2/8/2013	0.27
NH-TP-15-SS1	PCB Disposal Area	0.15	2/8/2013	<0.05
NH-TP-15-SS2	PCB Disposal Area	3.5	2/8/2013	<0.05
NH-TP-16-SS1	PCB Disposal Area	0.8	2/8/2013	1.2
NH-TP-16-SS2	PCB Disposal Area	3.5	2/8/2013	<0.05
NH-TP-DUP3 (NH-TP-16-SS2)	PCB Disposal Area	3.5	2/8/2013	<0.05
HHERA of the PCB Area, Dillon, 2013				
SS1A (0.3-0.8)	PCB Disposal Area	0.3-0.8	4/2/2013	<0.05
CCME Guideline				
Canadian Soil Quality Guideline (Commercial)				33

Notes:
<0.05: below the reported detection limit of 0.05 mg/kg
Brackets indicate duplicate sample (DUP=field duplicate; LD=laboratory duplicate)
Soil at this location was excavated and disposed off-site
PCB concentration exceeds the CCME soil quality guideline for industrial sites (33 mg/kg)
Imported fill not included in risk assessment calculations
[1]Two soil samples were taken in the immediate vicinity of the transformers to determine whether there had been any PCB soils in the transformers prior to burial (SGE, May 2003).
- : unknown

TABLE 2
PCB CONCENTRATIONS IN GROUNDWATER
Human and Ecolgical Risk Assessment, PCB Area
Upper Trinity South (New Harbour) Waste Disposal Site, Newfoundland and Labrador

Sample ID	Sample Date (M.Y)	PCB Concentration (µg/L)
MW-01	Feb. 2007	NA
MW-01	Nov. 2007	<0.04
MW-01	Mar. 2008	<0.05
MW-01	May. 2008	<0.04
MW-01	Mar. 2009	<0.04
MW-01	Oct. 2009	0.07
MW-01	Jan. 2010	<0.05
MW-01	Dec. 2010	<0.05
MW-01	Dec. 2011[1]	<0.06
MW-02	Feb. 2007	NA
MW-02	Nov. 2007	<0.04
MW-02	May. 2008	<0.04
MW-02	Oct. 2009	<0.05
MW-02	Jan. 2010	<0.06
MW-02	Dec. 2011[1]	<0.05
MW-03	Feb. 2007	***<0.4***
MW-03	Nov. 2007	<0.04
MW-03	May. 2008	<0.04
MW-03	Mar. 2009	<0.04
MW-03	Oct. 2009	<0.05
MW-03	Jan. 2010	<0.06
MW-03	Dec. 2010	<0.05
MW-03	Dec. 2011[1]	<0.05
MW-04	Feb. 2007	NA
MW-04	Nov. 2007	<0.04
MW-04	May. 2008	<0.04
MW-04	Mar. 2009	<0.04
MW-04	Oct. 2009	<0.05
MW-04	Jan. 2010	<0.05
MW-04	Dec. 2010	<0.05
MW-04	Dec. 2011[1]	<0.05
MW-05	Feb. 2007	<0.04
MW-05	Nov. 2007	<0.04
MW-05	May. 2008	<0.04
MW-05	Oct. 2009	<0.05
MW-05	Jan. 2010	<0.05
MW-05	Dec. 2010	<0.05
MW-05	Dec. 2011	<0.05
MW-06	Feb. 2007	NA
Ontario Ministry of Environment Guideline		
Groundwater Quality Guideline		0.14

Notes:
<0.04: below the reported detection limit of 0.04 mg/kg
<0.4 : elevated reported detection limit
Brackets indicate duplicate sample (Dup=field duplicate)
[1]Poor QA/QC performance
2007 data: AMEC, March 2008; 2008 data: AMEC, March 2009; 2009-2011 data: SNC, 2012
AMEC: sample analyzed by AMEC; MAX: sample analyzed by Maxxam
NA: sample not analyzed for PCBs
Guideline: OMOE 2011 GW-3 value for non-potable groundwater use, coarse grained soil, shallow depth condition

TABLE 2
PCB CONCENTRATIONS IN GROUNDWATER
Human and Ecolgical Risk Assessment, PCB Area
Upper Trinity South (New Harbour) Waste Disposal Site, Newfoundland and Labrador

Sample ID	Sample Date (M.Y)	PCB Concentration (µg/L)
MW-06	Nov. 2007	<0.04
MW-06	May. 2008	<0.04
MW-06	Oct. 2009	<0.05
MW-06	Jan. 2010	<0.05
MW-06	Dec. 2010	<0.05
MW-06	Dec. 2011[1]	<0.06
MW-07	Feb. 2007	NA
MW-07	Nov. 2007	<0.04
MW-07	May. 2008	<0.04
MW-07 (AMEC)	Mar. 2009	<0.04
DUP-2 (MW-07)	Mar. 2009	<0.05
MW-07 (MAX)	Mar. 2009	<0.05
MW-07	Oct. 2009	<0.05
MW-07-D (MW-07)	Jan. 2010	<0.05
MW-07	Dec. 2010	<0.05
MW-07	Dec. 2011[1]	<0.05
MW-09 (MW-07)	Dec. 2011	<0.05
MW-08	Jan. 2010	<0.05
MW-08	Dec. 2010	<0.05
MW-08	Dec. 2011[1]	<0.05
Ontario Ministry of Environment Guideline		
Groundwater Quality Guideline		0.14

Notes:
<0.04: below the reported detection limit of 0.04 mg/kg
<0.4 : elevated reported detection limit
Brackets indicate duplicate sample (Dup=field duplicate)
[1]Poor QA/QC performance
2007 data: AMEC, March 2008; 2008 data: AMEC, March 2009; 2009-2011 data: SNC, 2012
AMEC: sample analyzed by AMEC; MAX: sample analyzed by Maxxam
NA: sample not analyzed for PCBs
Guideline: OMOE 2011 GW-3 value for non-potable groundwater use, coarse grained soil, shallow depth condition

TABLE 3
PCB CONCENTRATIONS IN SURFACE WATER
Human and Ecolgical Risk Assessment, PCB Area
Upper Trinity South (New Harbour) Waste Disposal Site, Newfoundland and Labrador

Sample ID	Sample Date (M/D/Y)	PCB Concentration (mg/L)
SED A	Aug. 2002	<0.05
SED B	Aug. 2002	<0.05
TP-1[1]	Aug. 2002	***<0.5***
TP-2[1]	Aug. 2002	<0.05
TP-3[1]	Aug. 2002	<0.05
TP-4[1]	Aug. 2002	<0.05
TP-5[1]	Aug. 2002	<0.05
TP-6[1]	Aug. 2002	<0.05
SW-Pond	Nov. 2007	<0.04
SW-Pond	May. 2008	<0.04
SW-Pond	Mar. 2009	<0.04
SW-Pond	Sept. 2009	<0.05
SW-Pond-D (SW-POND)	Sept. 2009	<0.05
SW-Pond	Jan. 2010	<0.05
SW-Pond	Nov. 2010	<0.05
SW-Pond	Dec. 2011[2]	<0.05
SW-Pond-1 (SW-POND)	Dec. 2011	<0.06
Stream	Nov. 2007	<0.04
Stream	May. 2008	<0.04
Stream	Mar. 2009	<0.04
Stream	Sept. 2009	<0.05
Stream	Jan. 2010	<0.06
Stream	Nov. 2010	<0.05
Stream	Dec. 2011[2]	<0.05
Ditch	Mar. 2009	0.05

Notes:
<0.05: below the reported detection limit of 0.05 mg/kg
<0.5: elevated reported detection limit
Brackets indicate field duplicate sample
[1]Water sample taken within a test pit (not true surface water or groundwater)
[2]Poor QA/QC performance
Source of data is shown on the left
2007 data: AMEC, March 2008; 2008 data: AMEC, March 2009; 2009-2011 data: SNC, 2012

TABLE 4
PCB CONCENTRATIONS IN SEDIMENT
Human and Ecolgical Risk Assessment, PCB Area
Upper Trinity South (New Harbour) Waste Disposal Site, Newfoundland and Labrador

Field ID	Sample Depth (m)	Sample Date (M.Y)	PCB Concentration (mg/kg)
Environmental Testing (Final Report), SGE Acres, February 2003			
SED A	-	Aug. 2002	***<0.05***
SED B	-	Aug. 2003	***<0.05***
2010-2011 Annual Report of Activities, AMEC, March 2011			
POND-SED	0.05	Mar. 2010	***<0.05***
POND-SED	0.05	Nov. 2010	<0.01
STREAM-SED	0.05	Mar. 2010	***<0.05***
STREAM-SED	0.05	Nov. 2010	<0.01
DITCH-SED	0.05	Mar. 2010	***<0.05***
DITCH-SED-1 (DITCH-SED)	0.05	Mar. 2010	***<0.05***
DITCH-SED	0.05	Nov. 2010	2.8[1]
CCME Guidelines			
ISQG (Protection of Aquatic Life)			0.0341
PEL (Protection of Aquatic Life)			0.277

Notes:
<0.05: below the reported detection limit of 0.05 mg/kg
Brackets indicate field duplicate sample
Source of data is shown on the left
<0.05: reported detection limit is greater than the ISQG
[1]Considered to be more representative of a soil sample. Therefore it does not exceed the CCME sediment guidelines.
- : unknown

TABLE 5
PCB CONCENTRATIONS IN FISH
Human and Ecolgical Risk Assessment, PCB Area
Upper Trinity South (New Harbour) Waste Disposal Site, Newfoundland and Labrador

Sample ID	Location	Sample Date (M/D/Y)	PCB Concentration (mg/kg)
CONTROL (BT 029)	Gull Pond	9/29/2006	<0.005
CONTROL (BT 032)	Gull Pond	9/29/2006	<0.005
CONTROL (BT 031)	Gull Pond	9/29/2006	<0.005
CONTROL (BT 034)	Gull Pond	9/29/2006	<0.005
CONTROL (BT 035)	Gull Pond	9/29/2006	<0.005
CONTROL (BT 102)	Gull Pond	12/12/2006	<0.005
CONTROL (BT 107)	Gull Pond	12/12/2006	<0.005
CONTROL (BT 108)	Gull Pond	12/12/2006	<0.005
CONTROL (BT 117)	Gull Pond	12/12/2006	<0.005
CONTROL (BT 118)	Gull Pond	12/12/2006	<0.005
DUMP (BT 084)	Streams and Bogs South of Disposal Site	9/30/2006	<0.005
DUMP (BT 087)	Streams and Bogs South of Disposal Site	9/30/2006	<0.005
DUMP (BT 088)	Streams and Bogs South of Disposal Site	9/30/2006	<0.005
DUMP (BT 089)	Streams and Bogs South of Disposal Site	9/30/2006	<0.005
DUMP (BT 090)	Streams and Bogs South of Disposal Site	9/30/2006	<0.005
DUMP (BT 093)	Streams and Bogs South of Disposal Site	12/12/2006	<0.005
DUMP (BT 097)	Streams and Bogs South of Disposal Site	12/12/2006	<0.005
DUMP (BT 100)	Streams and Bogs South of Disposal Site	12/12/2006	<0.005
DUMP (BT 101)	Streams and Bogs South of Disposal Site	12/12/2006	<0.005
DUMP (BT 123)	Streams and Bogs South of Disposal Site	12/12/2006	<0.005

Notes:
<0.005: below the reported detection limit of 0.005 mg/kg
Source: Fish Sampling Program, AMEC, March 2007

APPENDIX E
WORKED EXAMPLE OF HHRE EXPOSURE AND RISK CALCULATIONS – PCBs

APPENDIX E WORKED EXAMPLE OF HHRA EXPOSURE AND RISK CALCULATIONS – PCBs

This appendix provides a worked example of HHRA exposure and risk calculations for a female toddler receptor.

E-1.0 EXPOSURE POINT CONCENTRATIONS, RAFs, ADJUSTMENT FACTORS, RECEPTOR/ENVIRONMENTAL PARAMETERS AND ASSUMPTIONS

Table E-1 provides the PCBs exposure point concentration (EPC) that was used to estimate exposure and risk to the female toddler receptor in the HHRA (i.e., the EPC for surface soil (<1.5 m) residual PCB concentrations only; N = 64). Attachment E-1 to this appendix provides the ProUCL 4.1 output that was used to determine the EPCs for PCBs.

Relative absorption factors (RAFs) that were used in the HHRA are presented in Table E-2.

Human receptor and exposure parameters used in the HHRA are previously provided in the main report, and are repeated here in Table E-3.

PCBs toxicity reference values (TRVs) used in the HHRA are provided in Table E-4.

Table E-1 PCBs Exposure Point Concentration (EPC) for the HHRA

Media	Units	EPC	Comments
Soil	mg/kg	27.1	UCLM95; N=64

Table E-2 Relative Absorption Factors for PCBs

Exposure Pathways	Value[a]	Reference/Comments
Dermal contact with soil	0.14	Health Canada, 2010a; OMOE, 2011
Outdoor soil ingestion	1.0	OMOE, 2011; Assumed
Soil/dust inhalation	1.0	Assumed

Notes:
a Unitless.

Table E-3 Key Receptor and Environmental Parameters for the Female Toddler Receptor

Parameter	Value	Reference
Body weight (kg)	16.4	Richardson, 1997
Inhalation rate (m^3/day)	8.3	Health Canada, 2010a
Duration of life stage (yrs)	4.5	Health Canada, 2010a
Years exposed to site contaminants (yrs)	35	Health Canada, 2010a
Time spent on-site	3 hours/day, 1 day/week, 48 weeks/year However, as PCBs are a known developmental toxicant (ATSDR, 2000; WHO, 2003), the exposure amortization (for EF and ED) was reduced to 1 day/week (as per Health Canada, 2010a guidance for exposure time amortization for both event driven soil contact exposure, and substances that are known to be developmental toxicants)	Assumed based on professional judgement
Soil ingestion rate (g/d)	0.08	CCME, 2006; Health Canada, 2010a
Hand surface area (m^2)	0.043	Richardson, 1997; Health Canada, 2010a; CCME, 2006
Hand soil adherence factor ($g/m^2/d$)	1	CCME, 2006; Health Canada, 2010a
Skin surface area other than hands (m^2) (upper and lower arms and legs)	0.277	Richardson, 1997
Skin soil adherence factor ($g/m^2/d$)	0.1	CCME, 2006; Health Canada, 2010a
Outdoor dust level from soil (g/m^3)	7.6×10^{-7} (recommended Health Canada, 2010a default value for urban dust level)	Health Canada, 2010a
Fraction of airborne dust generated from site soil	1.0	Assumed
Winter cover factor	0.67 (fraction of days without winter cover)	Based on EC Climate Normals Data For Heart's Content and Holyrood Generating Station meteorological stations (1971-2000). Both stations are located in similar terrain and coastal proximity as the subject site, and are the closest available stations to the subject site. Heart's Content station is roughly 33 km north of the subject site, while the Holyrood station is located roughly 33 km southeast of the subject site. (http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html)

Table E-4 Summary of TRVs Used in the HHRA

Chemical	Exposure Route	Chronic Toxicity Reference Value (TRV)		Health Endpoint(s)	Principal Study(ies)	Regulatory Agency Source
		Type	Value			
PCBs	Oral	RfD; TDI; MRL	0.02 µg/kg body weight/day	LOAEL for immunological effects, liver weight increases, and mild dermal and ocular effects in monkeys exposed to Aroclor 1254; 300-fold UF applied	Arnold et al., 1993a,b; Tryphonas et al., 1989; 1991a,b	U.S. EPA, 1996; ATSDR, 2000; WHO, 2003
	Inhalation	TCA	0.5 µg/m^3	LOAELs in various experimental animals exposed to Aroclor 1254 (details not provided by source agency); the TCA is one half of the values obtained for Aroclor 1254 to account for potential exposure to key PCB congeners of concern in other PCB mixtures	Details not provided by source agency	RIVM (Baars et al., 2001)

Notes:
TDI = tolerable daily intake; UF = uncertainty factor; RfD = reference dose; MRL = minimal risk level; TCA = tolerable concentration in air; LOAEL = lowest observable adverse effect level.

E-2.0 WORKED EXAMPLE OF EXPOSURE AND RISK CALCULATIONS

The following pages present the equations used in the HHRA to estimate PCBs exposure and risk, along with an illustrative worked example, for the female toddler receptor. The results of each calculation for PCBs are provided in bold below the equation boxes. There may be slight differences in some exposure and risk estimates presented herein versus those presented in the main report due to possible differences in rounding and the number of significant digits carried into the various calculations.

E-2.1 Exposure Calculations

E-2.1.1 Exposure from Direct Soil Contact Pathways (Ingestion, Dermal Contact, Inhalation)

Outdoor Soil Ingestion Exposure

$EXP_{OSI} = [SIR \times C_S \times AF \times ET_O] / BW$

Where:

EXP_{OI}	=	exposure *via* ingestion of outdoor soil (µg/kg body weight/day)
SIR	=	soil ingestion rate (g/day); 0.08
C_S	=	concentration of contaminant in soil (µg/g); 27.1 (UCLM95)
AF	=	fraction of chemical absorbed via ingestion (chemical specific, unitless); 1
ET_O	=	exposure time outdoors (unitless); 0.14 (based on 1 day/week)
BW	=	body weight (kg); 16.4

EXP_{OSI} = 0.019 µg/kg body weight/day

Outdoor Dermal (Hand) Soil Exposure

$EXP_{OD\ Hand} = [Cs \times SA_{Hand} \times AF \times ABS \times ET_O] / BW$

Where:

$EXP_{OD\ Hand}$	=	exposure *via* outdoor dermal (hand) contact (µg/kg body weight/day)
C_S	=	concentration of contaminant in soil (µg/g); 27.1 (UCLM95)
SA_{Hand}	=	surface area of the hand (m^2); 0.043
AF	=	adherence factor for soil for hands (g/m^2/day); 1
ABS	=	absorption fraction (unitless); 0.14
ET_O	=	exposure time outdoors (unitless); 0.14 (based on 1 day/week)
BW	=	body weight (kg); 16.4

$EXP_{OD\ Hand}$ = 0.0014 µg/kg body weight/day

Outdoor Dermal (Body – Upper and Lower Arms and Legs) Soil Exposure

$EXP_{OD\ Body} = [Cs \times SA_{Body} \times AF \times ABS \times ET_O] / BW$

Where:

$EXP_{OD\ Body}$	=	exposure *via* outdoor dermal (body) contact (µg/kg body weight/day)
C_S	=	concentration of contaminant in soil (µg/g); 27.1 (UCLM95)
SA_{Body}	=	skin surface area (m^2); 0.277
AF	=	adherence factor for soil other than hands (g/m^2/day); 0.1
ABS	=	absorption fraction (unitless); 0.14
ET_O	=	exposure time outdoors (unitless); 0.14 (based on 1 day/week)
BW	=	body weight (kg); 16.4

$EXP_{OD\ Body}$ = 0.00092 µg/kg body weight/day

Outdoor Soil/Dust Inhalation Exposure

$EXP_{Inh\ OD} = [BR \times C_S \times DL \times ADF \times ET_O] / BW$

Where:

$EXP_{Inh\ OD}$	=	exposure *via* inhalation of outdoor dust (µg/kg body weight/day)
C_S	=	concentration of contaminant in soil (µg/g); 27.1 (UCLM95)
BR	=	breathing rate (m^3/day); 8.3
DL	=	outdoor dust level (g/m^3); 7.6×10^{-7}
ADF	=	fraction of airborne dust generated from outdoor soil (unitless); 1 (assumed)
ET_O	=	exposure time outdoors (unitless); 0.14 (based on 1 day/week)
BW	=	body weight (kg); 16.4

$EXP_{Inh\ OD}$ = 0.0000015 µg/kg body weight/day

For all direct soil/dust contact pathways (*i.e.*, ingestion, dermal contact, inhalation), a winter cover factor (*i.e.*, 0.67) was applied. The winter cover-adjusted exposure estimates for these pathways are as follows.

Winter Cover-Adjusted Direct Soil Contact Exposure Estimates

EXP_{OSI} = 0.013 µg/kg body weight/day
$EXP_{OD\ Hand}$ = 0.00094 µg/kg body weight/day
$EXP_{OD\ Body}$ = 0.00062 µg/kg body weight/day
$EXP_{Inh\ OD}$ = 0.0000010 µg/kg body weight/day

E-2.1.2 Estimation of Total Site-Related Exposures via Inhalation, Dermal and Oral Exposure Pathways

Total Exposure through all Inhalation Pathways

$Total\ EXP_{Inh} = EXP_{Inh\ OD}$

Where:

$Total\ EXP_{Inh}$	=	total inhalation exposure (µg/kg body weight/day)
$EXP_{Inh\ OD}$	=	exposure *via* inhalation of outdoor dust[a] (µg/kg body weight/day); 0.0000010

$Total\ EXP_{Inh}$ = 0.0000010 µg/kg body weight/day

a Winter cover-factor adjusted exposure.

Total Exposure through all Oral and Dermal Pathways

$Total\ EXP_{Oral+Dermal} = EXP_{OSI} + EXP_{OD\ Hand} + EXP_{OD\ Body}$

Where:

$Total\ EXP_{Oral+Dermal}$	=	total oral and dermal exposure (µg/kg body weight/day)
EXP_{OSI}	=	exposure via ingestion of outdoor soil[a] (µg/kg body weight/day); 0.013
$EXP_{OD\ Hand}$	=	exposure via outdoor dermal (hand) contact with soil[a] (µg/kg body weight/day); 0.00094
$EXP_{OD\ Body}$	=	exposure via outdoor dermal (body) contact with soil[a] (µg/kg body weight/day); 0.00062

$Total\ EXP_{Oral+Dermal}$ = 0.015 µg/kg body weight/day

a Winter cover-factor adjusted exposures.

Total Exposure through all Pathways (Inhalation, Oral, Dermal)

$Total\ EXP = EXP_{Inh} + EXP_{OSI} + EXP_{OD\ Hand} + EXP_{OD\ Body}$

Where:

Total EXP	=	total inhalation, oral and dermal exposure (µg/kg body weight/day)
$EXP_{Inh\ OD}$	=	exposure *via* inhalation of outdoor dust[a] (µg/kg body weight/day); 0.0000010
EXP_{OSI}	=	exposure via ingestion of outdoor soil[a] (µg/kg body weight/day); 0.013
$EXP_{OD\ Hand}$	=	exposure via outdoor dermal (hand) contact with soil[a] (µg/kg body eight/day); 0.00094
$EXP_{OD\ Body}$	=	exposure via outdoor dermal (body) contact with soil[a] (µg/kg body eight/day); 0.00062

$Total\ EXP_{Oral+Dermal}$ = 0.015 µg/kg body weight/day

a Winter cover-factor adjusted exposures.

E-3.0 RISK CHARACTERIZATION CALCULATIONS

For COPCs with non-carcinogenic effects, the risk characterization stage of a human health risk assessment consists of a comparison between estimated exposures and the acceptable or "safe" intake level (*i.e.*, the toxicity reference value (TRV)). The numerical value associated with this comparison is called the hazard quotient (HQ) and is calculated as follows:

$$\text{Hazard Quotient (HQ)} = \frac{\text{Estimated Exposure (µg/kg body weight/day)}}{\text{TRV (µg/kg body weight/day)}}$$

For COPCs with carcinogenic effects (which was not considered to be the case for PCBs in the current HHRA; See Sections 4.3.2 and 4.4.2 of the main report), incremental lifetime cancer risk (ILCR) levels are typically used to communicate the estimated cancer risks associated with exposure estimates as follows:

ILCR = Estimated Lifetime Exposure (µg/kg body weight/day) x Cancer Slope Factor ([µg/kg body weight/day]$^{-1}$)

The following equations illustrate the calculation of risk estimates in the HHRA.

Human Health Risks Associated with Inhalation Exposure (Non-carcinogenic effects)

$$HQ_{Inhal} = \frac{TotalEXP_{Inhal}}{TRV_{Inhal}}$$

Where:

HQ_{Inhal}	=	hazard quotient (unitless)
Total EXP_{Inhal}	=	total inhalation exposure (µg/kg body weight/day); 0.0000010
TRV_{Inhal}	=	inhalation TRV (µg/kg body weight/day); 0.253

HQ_{Inhal} = 0.0000040

Human Health Risks Associated with Oral and Dermal Exposure (Non-carcinogenic effects)

$$HQ_{Oral+Dermal} = \frac{\text{Total EXP}_{\text{Oral + Dermal}}}{TRV_{Oral}}$$

Where:

$HQ_{Oral+Dermal}$	=	hazard quotient (unitless)
Total $EXP_{Oral+Dermal}$	=	total oral and dermal exposure (µg/kg body weight/day); 0.015
TRV_{oral}	=	oral TRV (µg/kg body weight/day); 0.02

$HQ_{Oral+Dermal}$ = 0.75

Human Health Risks Associated with Carcinogenic Effects

Since the PCB TRVs used in the HHRA are not based on carcinogenic effects, the following text describes how human health risks are estimated for carcinogens, when a cancer-based TRV (expressed as a slope factor or unit risk value) is available from the relevant regulatory agency.

Calculation of the ILCR involves first combining the total predicted exposures for each exposure route, and for each life stage, and then amortizing to account for the fraction of time that the life stage of interest represents out of a receptors total lifetime (e.g., 80 years as per Health Canada, 2010a), or, amortizing to account for the total amount of time the receptor is assumed to spend on the site, relative to the length of a given life stage. The ILCR is then calculated by multiplying this amortized exposure estimate by the inhalation and/or oral slope factors. Typically, ILCRs are calculated for specific pathways and/or media that are known or believed to be impacted by former or current site activities.

An example equation for calculation of ILCR is presented below. This equation is for all life stages to illustrate how exposure estimates for the different life stages are amortized in the calculation of an ILCR. If an ILCR is calculated, the 'exposure' term can be pathway, media, site, or facility-specific.

ILCR Calculation

$$ILCR = SF * \left[\left(EXP_{Infant} * \frac{0.5}{80} \right) + \left(EXP_{Toddler} * \frac{4.5}{80} \right) + \left(EXP_{Child} * \frac{7}{80} \right) + \left(EXP_{Teen} * \frac{8}{80} \right) + \left(EXP_{Adult} * \frac{60}{80} \right) \right]$$

Where:

ILCR	=	incremental lifetime cancer risk level (unitless)
SF	=	slope factor $(\mu g/kg \text{ body weight/day})^{-1}$
EXP_{Infant}	=	exposure for the infant (µg/kg body weight/day)
$EXP_{Toddler}$	=	exposure for the toddler (µg/kg body weight/day)
EXP_{Child}	=	exposure for the child (µg/kg body weight/day)
EXP_{Teen}	=	exposure for the teen (µg/kg body weight/day)
EXP_{Adult}	=	exposure for the adult (µg/kg body weight/day)

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APPENDIX F
PROUCL 4.1 OUTPUT SHEETS – EXPOSURE POINT CONCENTRATION (EPC) CALCULATIONS FOR PCBs

UCLM 95 for Combined Surface and Subsurface PCB Soil Concentrations

	General UCL Statistics for Full Data Sets			
User Selected Options				
From File	WorkSheet.wst			
Full Precision	ON			
Confidence Coefficient	95%			
Number of Bootstrap Operatio	2000			
C0				
General Statistics				
Number of Valid Observations		127	Number of Distinct Observations	98
Raw Statistics			Log-transformed Statistics	
Minimum		0.043	Minimum of Log Data	-3.14656
Maximum		600	Maximum of Log Data	6.39693
Mean		21.75084	Mean of log Data	0.575256
Geometric Mean		1.777586	SD of log Data	2.362771
Median		1.54		
SD		75.63747		
Std. Error of Mean		6.71174		
Coefficient of Variation		3.477451		
Skewness		5.939491		
Relevant UCL Statistics				
Normal Distribution Test			Lognormal Distribution Test	
Lilliefors Test Statistic		0.387057	Lilliefors Test Statistic	0.105739
Lilliefors Critical Value		0.07862	Lilliefors Critical Value	0.07862
Data not Normal at 5% Significance Level			Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution			Assuming Lognormal Distribution	
95% Student's-t UCL		32.87244	95% H-UCL	63.15768
95% UCLs (Adjusted for Skewness)			95% Chebyshev (MVUE) UCL	69.43966
95% Adjusted-CLT UCL (Chen-1995)		36.57041	97.5% Chebyshev (MVUE) UCL	87.89616
95% Modified-t UCL (Johnson-1978)		33.462	99% Chebyshev (MVUE) UCL	124.1504
Gamma Distribution Test			Data Distribution	
k star (bias corrected)		0.277338	Data do not follow a Discernable Distribution (0.05)	
Theta Star		78.42726		
MLE of Mean		21.75084		
MLE of Standard Deviation		41.30204		
nu star		70.44377		
Approximate Chi Square Value (.05)		52.12129	Nonparametric Statistics	
Adjusted Level of Significance		0.04811	95% CLT UCL	32.79066
Adjusted Chi Square Value		51.94116	95% Jackknife UCL	32.87244
			95% Standard Bootstrap UCL	32.69034
Anderson-Darling Test Statistic		7.173289	95% Bootstrap-t UCL	43.10707
Anderson-Darling 5% Critical Value		0.877591	95% Hall's Bootstrap UCL	72.54545
Kolmogorov-Smirnov Test Statistic		0.179436	95% Percentile Bootstrap UCL	33.64587
Kolmogorov-Smirnov 5% Critical Value		0.089924	95% BCA Bootstrap UCL	37.16761
Data not Gamma Distributed at 5% Significance Level			95% Chebyshev(Mean, Sd) UCL	51.00663
			97.5% Chebyshev(Mean, Sd) UCL	63.66564
Assuming Gamma Distribution			99% Chebyshev(Mean, Sd) UCL	88.5318
95% Approximate Gamma UCL (Use when n >= 40)		29.39703		
95% Adjusted Gamma UCL (Use when n < 40)		29.49898		
Potential UCL to Use			Use 95% Chebyshev (Mean, Sd) UCL	51.00663
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL				
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)				
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.				

UCLM 95 for Surface Soil (<1.5 m) PCB Concentrations

	General UCL Statistics for Full Data Sets		
User Selected Options			
From File	WorkSheet.wst		
Full Precision	ON		
Confidence Coefficient	95%		
Number of Bootstrap Operatio	2000		
C0			
General Statistics			
Number of Valid Observations	64	Number of Distinct Observations	50
Raw Statistics		Log-transformed Statistics	
Minimum	0.05	Minimum of Log Data	-2.99573
Maximum	260	Maximum of Log Data	5.560682
Mean	8.879234	Mean of log Data	0.260889
Geometric Mean	1.298083	SD of log Data	2.035218
Median	1.46		
SD	33.38697		
Std. Error of Mean	4.173371		
Coefficient of Variation	3.760118		
Skewness	7.042264		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.395716	Lilliefors Test Statistic	0.133436
Lilliefors Critical Value	0.11075	Lilliefors Critical Value	0.11075
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	15.84627	95% H-UCL	22.73478
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	25.2031
95% Adjusted-CLT UCL (Chen-1995)	19.66927	97.5% Chebyshev (MVUE) UCL	32.04271
95% Modified-t UCL (Johnson-1978)	16.45856	99% Chebyshev (MVUE) UCL	45.47779
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.343775	Data do not follow a Discernable Distribution (0.05)	
Theta Star	25.82862		
MLE of Mean	8.879234		
MLE of Standard Deviation	15.14392		
nu star	44.0032		
Approximate Chi Square Value (.05)	29.79018	Nonparametric Statistics	
Adjusted Level of Significance	0.04625	95% CLT UCL	15.74382
Adjusted Chi Square Value	29.5206	95% Jackknife UCL	15.84627
		95% Standard Bootstrap UCL	15.70773
Anderson-Darling Test Statistic	3.179331	95% Bootstrap-t UCL	37.02699
Anderson-Darling 5% Critical Value	0.852307	95% Hall's Bootstrap UCL	37.55415
Kolmogorov-Smirnov Test Statistic	0.160597	95% Percentile Bootstrap UCL	16.75683
Kolmogorov-Smirnov 5% Critical Value	0.120166	95% BCA Bootstrap UCL	22.74939
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	27.07054
		97.5% Chebyshev(Mean, Sd) UCL	34.94193
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	50.40376
95% Approximate Gamma UCL (Use when n >= 40)	13.11556		
95% Adjusted Gamma UCL (Use when n < 40)	13.23532		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	27.07054
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			