Taylor, Sheree L.

From: Joe Minor
Sent: August 25, 2012 9:29 PM
To: clerk@hamilton.ca
Subject: PFOS: Transport Canada
Attachments: transport.pdf

>
> To: The Mayor and All Members of Council c/o the Clerk
>
> Please include this communication in the next official (publicly
> accessible) information package for Hamilton City Council.
>
> This attachment is the letter from the Minister of Transport.
>
> Thanks,
>
> Joe Minor

Ministre des Transports,
de l'Infrastructure et des Collectivités
et ministre de l'Agence de développement
économique du Canada pour les régions du Québec

Minister of Transport,
Infrastructure and Communities
and Minister of the Economic Development Agency
of Canada for the Regions of Quebec

Ottawa, Canada K1A 0N5

JUL 3 0 2012

[redacted]

Dear Mr. Minor:

I am writing in response to the petition that you sent to the Office of the Commissioner of the Environment and Sustainable Development, dated March 27, 2012, regarding your request for federal assistance in dealing with Perflurocarbon (PFC) contamination (including PFOS and PFECHS) at the Hamilton International Airport (Ontario, Canada) pursuant to Section 22 of the *Auditor General Act*.

Your petition has been reviewed in relation to Transport Canada's mandate. I understand that the Minister of the Environment, the President of the Treasury Board and Minister for the Asia-Pacific Gateway, the Minister of Health, the Minister of Fisheries and Oceans, the Minister of Public Works and Government Services, and the Minister of National Defence will also respond to your letter according to their mandate and legislative responsibilities.

With respect to Transport Canada's area of responsibility, I am pleased to offer responses to questions 1, 2, 8 and 9 as well as your supplementary questions (SQ1-3), received via email following the receipt of the petition. Regarding the questions addressed to Transport Canada, I am pleased to offer the attached information.

Thank you for bringing your concerns to the Commissioner of the Environment and Sustainable Development. I trust, as they relate to Transport Canada, that the foregoing has clarified your questions regarding the presence of PFC and PFOS at the Hamilton International Airport.

Yours sincerely,

Denis Lebel, P.C., M.P

ENVIRONMENTAL PETITION # 332

Q#	Question	Answers
Q1	Will the federal government (including Transport Canada and any other departments that might have relevant information) please provide whatever information it can with respect to when, where, and how much PFCs were used at Hamilton International Airport?	From 1965 to 1996, the airport was leased to the City of Hamilton. In 1996, ownership of Hamilton International Airport was transferred to the Regional Municipality of Hamilton Wentworth. As such, Transport Canada has limited records for the Hamilton International Airport. Historically, there were two former Fire Training Areas at the airport. The initial Fire Training Area (FTA1) was used from 1965 until 1984. The second Fire Training Area (FTA2) was constructed in 1985 and was used until 1994. A map showing the locations of these Fire Training Areas is attached in Annex 1. Prior to the closure in 1994, FTA2 was used to conduct training for Transport Canada and Hamilton International Airport fire fighters. A 1994 Interim Surface and Groundwater Monitoring Program at the Hamilton International Airport Fire Training Area report, prepared by Decommissioning Consulting Services Limited, indicated that 16,296 litres of Aqueous Film Forming Foam (AFFF) was used during fire training activities in 1993 at the Hamilton International Airport. Table 2.4, which includes an inventory of fuels and fire fighting materials used in 1993 from the 1994 report, is attached in Annex 2. Transport Canada does not have a copy of the final report. The final report is mentioned in the 2011 Initial Subsurface Investigation Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoate (PFOA) prepared by Exp Services Inc. for the Hamilton International Airport. It is suggested to contact the City of Hamilton or the Hamilton International Airport directly to obtain a copy of the report.

Q2	Will the federal government (including Transport Canada, Environment Canada and any other departments that might have relevant information (e.g., the Pesticide Management Regulatory Agency?)) please use their technical expertise to help us understand what PFCs were used at the airport after ownership was transferred? **Transport Canada as Regulatory Authority & Information from Airport Regulators** It would be useful to know the regulations regarding AFFF's and AHF's and how they have changed with time. Part of the problem facing current investigations is the current airport operator does not know what is in the formulation they stock, in part because they are "trade secrets". Transport Canada should know, or be able to find out, what these formulations are.	As a result of the ownership transfer in 1996 to the Regional Municipality of Hamilton Wentworth, Transport Canada has no record of PFCs used at Hamilton International Airport after that year. Note that the Fire Training Area was closed in 1994. With respect to live fire training exercises and the use of AFFF, from 1981 to 1996 these exercises were conducted at airports owned by Transport Canada in accordance with the *Airport Emergency Services Firefighter Training Policy and Aircraft Emergency and Fire Training Manual Part II.* The policy required that the minimum annual training materials allotment for firefighter personnel was Foam 450 litres protein and/or 340 litres AFFF, and are attached in Annex 3. After 1996, live fire training exercises were regulated under Part III of the *Canadian Aviation Regulations* (CARs), Subpart 303 – Aircraft Rescue and Fire fighting at Airports and Aerodromes – which replaced the *Airport Emergency Firefighter Training Policy and Fire Training Manual Part II.* Firefighter training requirements are documented in CAR 303, Division III–Personnel Requirements–and must be conducted in accordance with the referenced Standard 323 –Aircraft Fire Fighting at Airports and Aerodromes – with specific reference to 323.14–Training of Personnel–, in particular 323.14(2)(xi) CAR 303 can be found on the Transport Canada website at: http://www.tc.gc.ca/eng/civilaviation/regserv/cars/part3-subpart3-157.htm CAR 323 can be found on the Transport Canada website at: http://www.tc.gc.ca/eng/civilaviation/regserv/cars/part3-standards-323-1022.htm The 1994 Interim Surface and Groundwater Monitoring Program at the Hamilton International Airport Fire Training Area report, prepared by Decommissioning Consulting Services Limited, included a table of the approximate chemical composition, as well as a copy of the Material Safety Data Sheets (MSDSs) for the AFFFs, namely FC206 (3M Canada Inc.) and 6% AFFF–Government (Angus Fire Amour Ltd). The volume of AFFF referenced in Table 2.4 in Question 1 does not specify the type of AFFF used. A copy of Table 2.2 and the MSDSs for the AFFFs from the 1994 report are attached in Annex 4. With respect to Aviation Hydraulic Fluids, specifics on the fluid formulations are not known. The CARs Part V, Chapter 525 of the Airworthiness Manual, Subchapter F, section 525.1435 *Hydraulic Systems*, article (*b*)(5) states that each hydraulic system shall be designed to use any suitable hydraulic fluid specified by the airplane manufacturer. For information on the formulations, aircraft manufacturers may be contacted directly. CAR 525 can be found on the Transport Canada website at: http://www.tc.gc.ca/eng/civilaviation/regserv/cars/part5-standards-525-sub-f-1742.htm

Q8	Will the federal government (Transport Canada, Public works and Government Services Canada, Real Property Institute of Canada, Environment Canada) please use its experience with contaminated sites and their clean up to assist with the cleanup of the toxic mess at Hamilton International Airport?	Transport Canada works with other departments, including Health Canada and Environment Canada, to protect human health and the environment associated with contaminated sites. As a member of the Federal Contaminated Sites Action Plan working group, Transport Canada participates in various meetings and conferences, such as the recent Real Property Institute of Canada (RPIC) Federal Contaminated Sites National Workshop held on April 30-May 3, 2012, This forum provides an opportunity for federal departments to discuss and share their experiences concerning various contaminated site issues and remedial options. At the recent RPIC workshop, an environmental consultant, on behalf of Transport Canada, delivered a presentation on PFCs and a poster abstract. A copy of the presentation and poster are attached in Annex 5. Transport Canada is currently reviewing the situation at Hamilton International Airport and will make a decision on its involvement with any cleanup after completing its review.
Q9	Will the federal government (e.g., Transport Canada, RCAF, Public works and Government Services Canada, Real Property Institute of Canada, Environment Canada) please make its best efforts to publicly identify other locations contaminated with PFOS?	As a federal department, Transport Canada is required to provide information regarding its contaminated sites on the Federal Contaminated Sites Inventory (FCSI) in compliance with the Treasury Board Reporting Standard on Real Property. TC uses the FCSI to publicly identify its known contaminated sites. Sufficient information needs to be known about a site to confirm whether or not it is considered contaminated. According to the Treasury Board Policy on the Management of Real Property, a contaminated site is a site at which substances occur at concentrations that: (1) are above background levels and pose, or are likely to pose, an immediate or long-term hazard to human health or the environment, or (2) exceed the levels specified in policies and regulations. Given that PFOS is an emerging contaminant, soil and groundwater guidelines/standards to assess an immediate or long-term hazard to human health or the environment, or to determine exceedences of contaminant levels are not available. Moreover, recent sampling and analytical studies of groundwater have indicated that concentration levels of PFOS have been difficult to accurately quantify. Sound sampling and analytical procedures are necessary to ensure data collected is scientifically defensible. The department is working closely with Health Canada and Environment Canada to establish national guidance on PFOS management for the purpose of assessing an immediate or long-term hazard to human health or the environment. TC is reviewing the circumstances in which this substance may have been used at Canadian airports. As part of this response, TC is providing a list of sites that have confirmed the presence of PFOS in Annex 6, recognizing that these sites are not identified on the FCSI in relation to PFOS, due to the preceding issues.

Three supplemental questions received from Mr. Minor via email.		
SQ1	FCSI Site Number 10855002: London Airport 1) Is this site contaminated with PFOS/PFOA? 2) If it is, can I please see the data? 3) If it is, what are the FCSI policies with respect to notifying the public about the locations and levels of contamination?	1) PFOS and PFOA have been detected at FCSI Site Number 108550002- London Airport. 2) Sample results from the Terrapex Supplemental Phase III Environmental Site Assessment, March 2011 report are attached in Annex 7. Recent sampling and analytical studies of groundwater have indicated that concentration levels of PFOS have been difficult to accurately quantify. As sound sampling and analytical procedures are necessary to increase the confidence in data being collected, further work to improve these procedures will be required. 3) Response below was provided by Treasury Board. Treasury Board policies for the management of federal real property require departments to manage property in an environmentally responsible manner. These policies are principle-based and therefore do not explicitly outline how or when the presence of contamination should be communicated to the public. The Treasury Board Reporting Standard on Real Property requires that custodian departments maintain a current, complete and accurate record of known and suspected contaminated sites for which they are accountable in the Federal Contaminated Sites Inventory (FCSI), which is a publicly accessible repository of data. The FCSI contains information on the key characteristics of these contaminated sites, their location and how they are being managed. Under the Treasury Board Policy on Management of Real Property, custodian departments are responsible for the management of their contaminated sites.

SQ2	I am interested in knowing: 1) Is PFOS (perfluorooctane sulfonate) a contaminant on "FCSI Site Number 08708009"? 2) Is "FCSI Site Number 08708009" the site in "eastern Ontario" that is referred to in the following abstract: http://www.rpic-ibic.ca/downloads/FCS_2012/2012_PosterAbstracts.pdf 3) If "FCSI Site Number 08708009" is not the same as the site referred to by Mr.Tarnocai, could you please put me in contact with someone who would know where the site referred to in the abstract is? (Mr.Tarnocai was not cooperative on this matter.)	1) PFOS has been detected at FCSI Site Number 08708009-Ottawa Macdonald-Cartier International Airport, former DND Fire Training Area. 2) FCSI Site Number 08708009 is not the site in "eastern Ontario" referred to in the abstract. The site mentioned in the abstract is located at CFB Trenton and is under the purview of the Department of National Defence (DND). 3) DND advises that inquiries regarding this site should be directed to Major Holly Apostoliuk, Department of National Defence, at 204-833-2500 extension 2030.
SQ3	I am interested in more information about "Contaminated Site N0033001". 1) Is/was this site contaminated with PFOS? It appears that $2,120,435.86 was spent on remediation at this site. 2) Was all of this federal money? 3) If not, how much was federal money? 4) Where can I find out more information about what remedial actions were done at this site, and see data regarding their effectiveness? 5) Is this site the same site that is described in the following link as being in the "interior of British Columbia"? http://www.rpic-ibic.ca/downloads/FCS_2012/2012_PosterAbstracts.pdf	FCSI Site Number N0033001-Williams Lake Airport 1) During the hydrocarbon cleanup of the Williams Lake Airport former fire training area (FTA), Transport Canada discovered the existence of PFOS. Upon this discovery, Transport Canada completed an assessment to determine risks to human health and the environment. In the absence of PFOS environmental quality standards/guidelines, risk-based targets for specific PFCs were developed. Results of the assessment indicated that due to the subsurface conditions, there is no risk to human or ecological receptors at the site. Transport Canada has not done any specific remediation of PFOS at the Williams Lake Airport. To date, Transport Canada has spent $2.9M to remediate the hydrocarbon contamination at the fire training area at Williams Lake Airport. 2) Yes, all of the expenditures reported in the Federal Contaminated Sites Inventory for Site Number N0033001 were from federal funding. 3) Response provided in question SQ3-2. 4) Remedial work at the site began in 2005 with the installation of a remediation extraction system designed to remove liquid hydrocarbons (fuel). The vacuum enhanced extraction system has been operated annually. Liquid hydrocarbons were targeted for removal since they are capable of migrating underground. The most recent monitoring data indicates that the liquid hydrocarbons have been effectively removed. We are currently finalizing a risk management plan in preparation to decommission the extraction system. 5) Yes, this is the same site.

	6) If the site from the link is a different site, then could you please let me know the location of the "interior of British Columbia" site?	6) Yes, this is the same site.

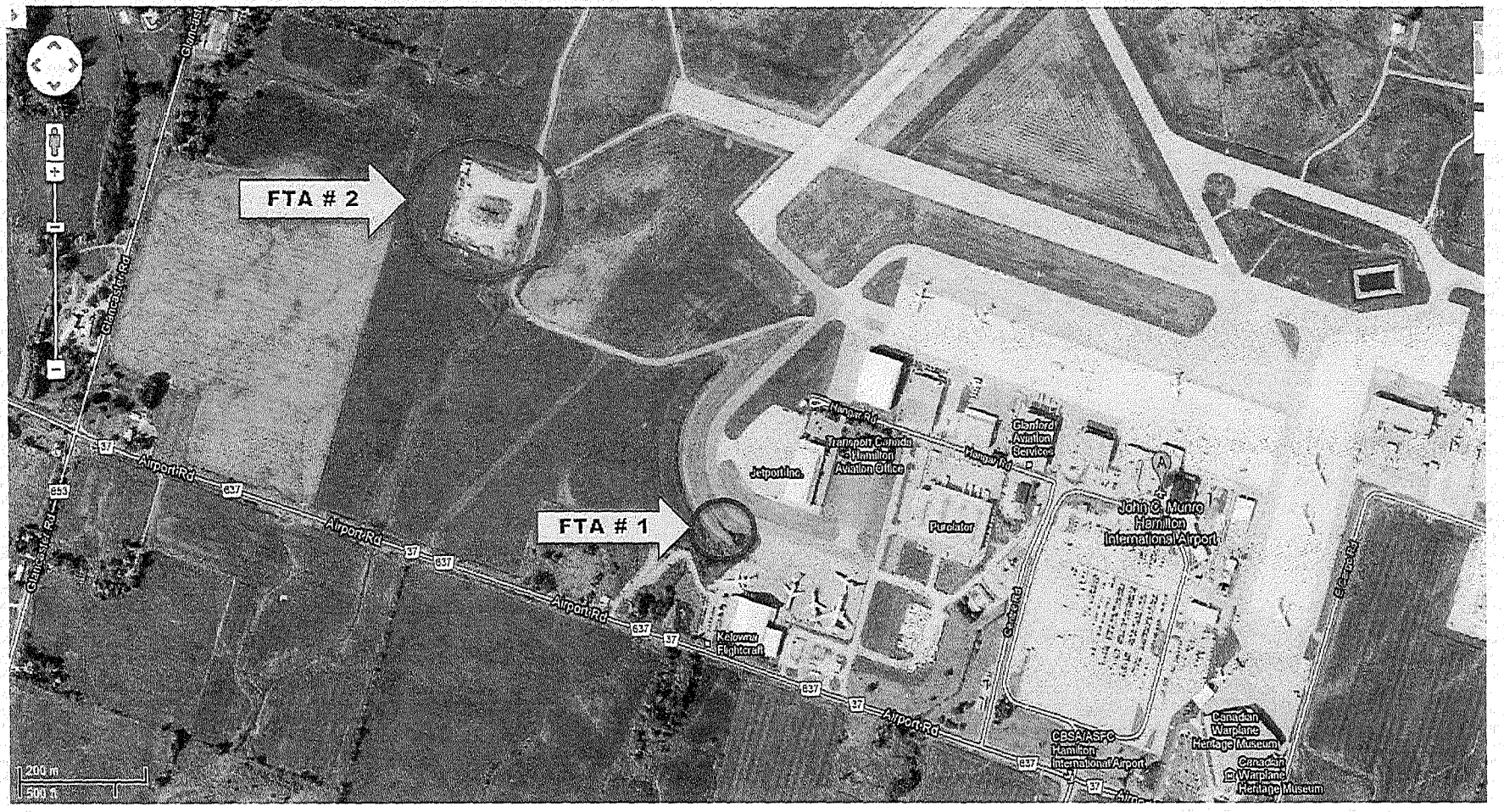
Taylor, Sheree L.

From: Joe Minor [jminor@cogeco.ca]
Sent: August 25, 2012 10:18 PM
To: clerk@hamilton.ca
Subject: PFOS: Transport Canada Annexes 1-3
Attachments: Annex123.pdf

>
>>
>> To: The Mayor and All Members of Council c/o the Clerk
>>
>> Please include this communication in the next official (publicly
>> accessible) information package for Hamilton City Council.
>>
>> This attachment contains supplemental information (Annexes 1-3) from
>> the Minister of Transport.
>>
>> Thanks,
>>
>> Joe Minor
>

ANNEX 1
LOCATION OF HAMILTON AIRPORT FORMER FIRE TRAINING AREAS

LOCATION OF HAMILTON AIRPORT FORMER FIRE TRAINING AREAS



ANNEX 2
Table 2.4 – INVENTORY OF FIRE TRAINING MATERIALS USED IN 1993 AT THE HAMILTON AIRPORT FTA

TABLE 2.4

INVENTORY OF FIRE TRAINING MATERIALS USED IN 1993 AT THE HAMILTON AIRPORT FTA

FIRE TRAINING MATERIAL	FIRE TRAINING SESSIONS, 1993 - WEEK OF										TOTAL
	17 May	21 June	12 July	30 Aug.	13 Sept.	27 Sept.	18 Oct.	1 Nov.	15 Nov.	6 Dec.	
Unleaded Gasoline, ℓ	32,049	41,388	5,900	39,663	21,247	24,003	32,827	2,394	23,037	20,433	242,941
Aqueous Film Forming Foam (AFFF), ℓ	978	1,769	440	1,840	1,755	1,765	2,852	232	2,347	2,318	16,296
Dry Chemical (Purple K), Kg	2,721	0	816	930	930	2,404	1,792	0	1,270	590	10,523
Nitrogen Cylinders	20	3	8	9	9	28	18	1	13	6	118

ANNEX 3
AIRPORT EMERGENCY SERVICES FIREFIGHTER TRAINING POLICY AND AIRCRAFT EMERGENCY AND FIRE TRAINING MANUAL PART II

TP 3193

AIRPORT EMERGENCY SERVICES FIREFIGHTER TRAINING

AK-12-06-002

SERVICES D'URGENCE AÉROPORTUAIRES FORMATION DES POMPIERS

48 pages
(Scan separately)

Airports and Construction Services Directorate
Airport Services and Security Branch
Airport Emergency Services Division

Direction générale des services des aéroports et de la construction
Direction des services et sûreté aéroportuaires
Division des services d'urgence aéroportuaires

OPR/BPR: DGK/DKS/KSET

NOVEMBER/NOVEMRRE 1981

Taylor, Sheree L.

From: Joe Minor [jminor@cogeco.ca]
Sent: August 25, 2012 10:48 PM
To: clerk@hamilton.ca
Subject: PFOS: Transport Canada Annex 4
Attachments: Annex4.pdf

To: The Mayor and All Members of Council c/o the Clerk

Please include this communication in the next official (publicly accessible) information package for Hamilton City Council.

This attachment contains supplemental information (Annex 4) from the Minister of Transport.

Thanks,

Joe Minor

ANNEX 4
Table 2.2 – FIRE RETARDANT AGENTS
MSDS FOR AFFF

TABLE 2.2

FIRE RETARDANT AGENTS

PRODUCT NAME	MANUFACTURER	COMPOSITION
Purple K	Pyrene Fire Security Inc.	95% potassium bicarbonate
		5% siliceous muscoirte (mica)
		- pigments (methyl violet, barium lithol red, Red Lake C)
6% AFFF - Government	Angus Fire Amour Ltd.	65 - 89% water
		10 - 30% 2-(2-Butoxy ethoxy) ethanol
		1 - 5% Octylphenoxypoly-ethoxyethanol
FC-206 Light Water Brand AFFF	3M Canada Inc.	80% water
		15% 2-(2-Butoxy ethoxy) ethanol
		<5% Fluoroalkyl surfactants
		<5% Synthetic detergents

MATERIAL SAFETY DATA SHEET

WHMIS CLASSIFICATION: D2B

USE: FIRE FIGHTING FOAM

I. IDENTIFICATION

ANGUS FIRE ARMOUR LTD.,
P.O. BOX 189,
THURSO, QUEBEC
J0X 3B0

ANGUS FIRE ARMOUR LTD.,
11 CURITY AVENUE,
TORONTO, ONTARIO
M4B 1X5

PRODUCT NAME: 6% AFFF - GOVERNMENT

CHEMICAL NAME: Not Appl. CHEMICAL FAMILY: Not Appl.

FORMULA: Not Appl. MOLECULAR WEIGHT: Not Appl.

SYNONYMS: Not Av.

CAS #: Not Appl. CAS NAME: Not Appl.

II. PHYSICAL DATA

BOILING POINT, 760 mm Hg	97°C	FREEZING POINT	-3°C
SPECIFIC GRAVITY (H_2O = 1)	1.02	VAPOUR PRESSURE at 20°C	Not Av.
VAPOUR DENSITY (air = 1)	Not Av.	SOLUBILITY IN WATER % by wt	100%
PERCENT VOLATILES BY VOLUME	80%	EVAPORATION RATE (Butyl Acetate = 1)	0.46

APPEARANCE AND ODOUR Clear straw coloured liquid, mild sweet odour

EMERGENCY PHONE NUMBER : (819) 985-2901 OR (416) 755-7785

III. HAZARDOUS INGREDIENTS

MATERIAL	CAS #	% BY WEIGHT	HAZARDS
2(2 Butoxy-ethoxy)ethanol	112-34-5	10-30	Toxic
Octylphenoxypoly-ethoxyethanol	9036-19-5	1-5	Toxic

IV. HEALTH HAZARD DATA

EFFECTS OF ACUTE OVEREXPOSURE

SWALLOWED — Slightly toxic. May produce signs of intoxication characterized by incoordination, dizziness, drowsiness, headache, nausea, mental confusion, possibly slurred speech and stupor, depending on the quantity of material ingested.

SKIN ABSORPTION — Prolonged or widespread skin contact may result in the absorption of potentially harmful amounts of material.

INHALATION — Inhalation of vapours from heated product may cause irritation of the upper respiratory tract.

SKIN CONTACT — Brief contact should not be irritating. Prolonged contact may cause skin irritation with redness and swelling at the site of contact.

EYE CONTACT — Causes stinging and pain with excess redness and swelling of the conjunctiva.

EFFECTS OF CHRONIC OVEREXPOSURE — Prolonged exposure to mist generated at elevated temperature may result in the inhalation of potentially harmful amounts of material.

EMERGENCY AND FIRST AID PROCEDURES

SWALLOWING	If victim is conscious, give 2 glasses of water and induce vomiting.
SKIN	Remove contaminated clothing and flush skin with plenty of water. Wash clothing before reuse.
EYES	Immediately flush with plenty of running water for at least 15 minutes. Get medical attention.
INHALATION	Move to fresh air. If symptoms develop, call a physician.

V. EXPOSURE LIMITS AND TOXICOLOGICAL DATA

	TLV-TWA ppm ACGIH 1988-89	LD50 Rat oral	LC50 Rat inhalation	LD50 Rabbit skin
2(2-Butoxy-ethoxy)ethanol	Not Av.	6560 mg/kg	Not Av.	4120 mg/kg
Octylphenoxypoly-ethoxyethanol	Not Av.	> 2 g/kg	Not Av.	> 3 g/kg

Toxicity data references: MSDS for TRITON X-102 SURFACTANT (VAN WATERS & ROGERS INC., 1989-01-10). RTECS supplied by CCRIS, April 1989.

VI. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Test method (s))	Not Appl.
FLAMMABLE LIMITS IN AIR (% by volume)	Not Appl.
EXTINGUISHING MEDIA	After water evaporates, remaining material will burn. Use water spray, carbon dioxide, alcohol-type or all-purpose-type foam.

SPECIAL FIRE FIGHTING PROCEDURES	Use a self-contained breathing apparatus and protective clothing.
UNUSUAL FIRE AND EXPLOSION HAZARDS	Not Av.

VII. REACTIVITY DATA

STABILITY

UNSTABLE	STABLE	CONDITIONS TO AVOID
	X	: None

INCOMPATIBILITY (materials to avoid) :	High concentration of alkali at elevated temperatures.
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS :	Carbon monoxide and carbon dioxide

HAZARDOUS POLYMERIZATION

MAY OCCUR	WILL NOT OCCUR	CONDITIONS TO AVOID
	X	: None

VIII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED	Soak up with solid absorbent and collect for disposal.
WASTE DISPOSAL METHOD	Dispose in accordance with Federal, Provincial and Municipal regulations.

IX. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (specify type)	None required in normal use.
VENTILATION	General (mechanical) ventilation
PROTECTIVE GLOVES	Rubber
EYE PROTECTION	Safety goggles
OTHER PROTECTIVE EQUIPMENT	Eyes bath and safety shower.

X. SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.

XI. PREPARATION

MSDS PREPARED BY: Eco-Research (Canada) Inc.

TELEPHONE NO.: (514) 697-3273 DATE: May 1989

N.B. : This information is given in good faith, though no warranty, express or implied, can be given since results may vary in accordance with applications.

3M Canada Inc.
Post Office Box 5757
London, Ontario N6A 4T1
Medical Emergency Telephone: (519)451-2500, Ext. 2222

Material Safety Data Sheet

Document id	: 10-3818-1	Issue date	: 12/08/93
Version	: 3.00	Supersedes date	: 09/13/93

Prepared by: Corporate Loss Prevention Department, 3M Canada Inc.
Telephone: (519) 452-6102, Fax: (519) 452-6015.

1 Product Identification

Tradename:
FC-206 LIGHT WATER BRAND AQUEOUS FILM FORMING FOAM
3M Product ID:

CF-1206-0205-1	CF-1206-0206-9	CF-1206-0211-9	ZF-0002-0054-1
ZF-0002-0055-8	ZF-0002-0092-1	ZF-0002-0119-2	ZF-0002-4108-1
ZF-0002-4109-9	CF-1206-0269-7		

Intended Use of Product:
Fluorochemical

2 Chemical Composition

Ingredient Name	CAS Number	Percentage
WATER	7732-18-5	75.0 - 83.0
ETHANOL,2-(2-BUTOXYETHOXY)-	112-34-5	16.6 - 18.4
ALKYL SULFATE SALTS	---	1.0 - 5.0
AMPHOTERIC FLUOROALKYLAMIDE DERIVATIVES	---	1.0 - 5.0
PERFLUOROALKYL SULFONATE SALTS	---	0.5 - 1.5

NOTE:
ALKYL SULFATE SALTS is a Trade Secret. Refer to section 15 for further information.
AMPHOTERIC FLUOROALKYLAMIDE DERIVATIVES is a Trade Secret. Refer to section 15 for further information.
PERFLUOROALKYL SULFONATE SALTS is a Trade Secret. Refer to section 15 for further information.

3 Hazards Identification

Critical Hazards
Inhalation may cause: Central Nervous System Depression: signs/symptoms can include headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
See Sections 7 and 11 for further information.

4 First Aid Measures

Instructions for Eye Contact:
Immediately flush eyes with large amounts of water. Get immediate medical attention.
Instructions for Skin Contact:
Flush skin with large amounts of water. If irritation persists, get medical attention.
Instructions for Inhalation:
If signs/symptoms occur, remove person to fresh air. If signs/symptoms continue, call a physician.
Instructions for Ingestion:
Drink two glasses of water. Call a physician.

5 Fire Fighting Measures

Flash point:	None (Setaflash)
Lower Explosive Limit(%):	Not applicable.
Upper Explosive Limit(%):	Not applicable.
Autoignition temperature:	Not applicable.

Suitable Extinguishing Media:
Product is a fire-extinguishing agent.
Exposure Hazards during Fire:
No data available.
Combustion Products from Fire:
None known.
Fire Fighting Procedures:
Not applicable

6 Accidental Release Measures

Personal Precautions:
No data available.

Spill Response:
Observe precautions from other sections. Cover with absorbent material. Collect spilled material. Place in a closed container.

7 Handling and Storage

Storage Requirements:
Store in a cool place. Keep container dry.
Incompatible Materials:
Store away from heat. Store out of direct sunlight.
Ventilation:
Keep container in well-ventilated area.
Use Instructions:
Keep container tightly closed.

8 Exposure Controls/Personal Protection

Personal Protection

Eye Protection:
Avoid eye contact with vapour, spray, or mist. Wear vented goggles.
Hand Protection:
Wear appropriate gloves when handling this material. A pair of gloves made from the following material(s) are recommended: butyl rubber;
Skin Protection:
Avoid skin contact.
Respiratory Protection:
Avoid breathing of vapors, mists or spray. Select one of the following NIOSH approved respirators based on airborne concentration of contaminants: Half-mask organic vapour respirator with dust/mist prefilter;
Ingestion (Prevention):
Do not eat, drink or smoke when using this product. Wash exposed areas thoroughly with soap and water. Wash hands after handling and before eating.
Recommended Ventilation:
Use with adequate dilution ventilation.

Ingredient Exposure Data

WATER (7732-18-5)
Specific Ingredient Data: Not applicable.

ETHANOL,2-(2-BUTOXYETHOXY)- (112-34-5)
LD50 (rat, oral): 5660 mg/kg
CMRG TWA Exposure Limit: 35 ppm

ALKYL SULFATE SALTS
Specific Ingredient Data: No data available.

AMPHOTERIC FLUOROALKYLAMIDE DERIVATIVES
Specific Ingredient Data: No data available.

PERFLUOROALKYL SULFONATE SALTS
Specific Ingredient Data: No data available.

9 Physical and Chemical Properties

Physical form,Color,Odour:	liquid; clear; amber;
Odour Threshold:	No data available.
pH:	Approx. 8.50
Boiling point/boiling range:	100.00 C (Initial)
Melting point/melting range:	Not applicable.
Vapour pressure:	Approx. 30.4000 mmHg at 20 C
Water Solubility:	Miscible.
Partition coefficient (K o/w):	No data available.
Specific gravity:	Approx. 1.010 Water=1
Vapour density:	Approx. 0.62 Air=1 at 20 C
Volatile organic compounds:	Unknown
Evaporation rate:	< 1.00 BuOAc=1
Viscosity:	Unknown

10 Stability and Reactivity

Conditions to Avoid:
None known.
Materials to Avoid:
Not applicable.
Hazardous Decomposition:
Carbon monoxide and carbon dioxide; Hydrogen fluoride; Thermal decompostion of usage concentrations does not present a hazard.
Stability and Reactivity:
Stable. Hazardous polymerization will not occur.

11 Toxicological Information

Effects from Eye Contact:
Mild Eye Irritation: signs/symptoms can include redness, swelling, pain, and tearing.

Effects from Skin Contact:
Mild Skin Irritation (after prolonged or repeated contact): signs/symptoms can include redness, swelling, and itching.
Prolonged or repeated exposure may cause: May be absorbed through the skin in harmful amounts.

Effects from Inhalation:
Single overexposure, above recommended guidelines, may cause: Central Nervous System Depression: signs/symptoms can include headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. Irritation (upper respiratory): signs/symptoms can include soreness of the nose and throat, coughing and sneezing.
Prolonged or repeated overexposure, above recommended guidelines, may cause: Kidney Effects: signs/symptoms can include reduced urine volume, blood in urine and back pain. Liver Effects: signs/symptoms can include yellow skin(jaundice) and tenderness of upper abdomen.

Effects from Ingestion:
Ingestion is not a likely route of exposure to this product.

Sensitization Information:
No data available.

Carcinogenicity:
No data available.

Mutagenicity:
No data available.

Reproductive Effects:
No data available.

Other Effects & Information:
A 3M Product Toxicity Summary Sheet is available.

12 Ecological Information

Ecotoxicity Data:
No data available.

Other Effects and Information:
Chemical Oxygen Demand (COD): 0.42 g/g 5 Day Biological Oxygen Demand (BOD-5): 0.21 g/g 14-Day Biochemical Demand (BOD20): 0.42 g/g

13 Disposal Considerations

Product as Sold:
No data available.
Product Packaging:
No data available.
Special Instructions:
Discharge spent solutions and small quantities (less than 5 gal.(19 L)) to a wastewater treatment system. Reduce discharge rate if foaming occurs.
Incinerate in an industrial or commercial facility in the presence of a combustible material. Combustion products will include HF.
Disposal alternative: Dispose of completely absorbed waste product in a facility permitted to accept chemical wastes.

14 Transportation Information

Transportation of Dangerous Goods

TDG Classification:	Non-Regulated Material.

International Dangerous Goods Classification

IMO Class:	No data available.
ICAO Class:	No data available.

15 Regulatory Information

WHMIS Classification:	D2B
HMIRC Registry Number:	1003-001
Filing Date:	November 14, 1988

NOTE:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

16 Other Information

Reason for Reissue:
Formulation revision.

The information on this data sheet represents our current data and

best opinion as to the proper use in handling of this product under normal conditions. Any use of the product which is not in conformance with this data sheet or which involves using the product in combination with any other product or any other process is the responsibility of the user.

Taylor, Sheree L.

From: Joe Minor [jminor@cogeco.ca]
Sent: August 26, 2012 11:53 AM
To: clerk@hamilton.ca
Subject: PFOS: Transport Canada Annex 5, partA
Attachments: Annex5A.pdf

> To: The Mayor and All Members of Council c/o the Clerk
>
> Please include this communication in the next official (publicly
> accessible) information package for Hamilton City Council.
>
> This attachment contains supplemental information (Annex 5, part A)
> from the Minister of Transport.
>
> Thanks,
>
> Joe Minor
>

ANNEX 5
RPIC POSTER
AND
PRESENTATION ON
EVALUATION OF GROUNDWATER TRANSPORT OF PERFLURINATED CHEMICALS AT A FORMER FIRE-FIGHTING TRAINING AREA

Terrestrial Wildlife Exposure to Perfluorinated Chemicals at a Former Fire-Fighting Training Area

Kirstin H. Webster[1]*, Lindsay Paterson[2], Ian Chatwell[3], Raman Birk[4]

[1]SLR Consulting (Canada) Ltd., 200-1620 West Eighth Avenue, Vancouver, British Columbia, Canada [2]SLR Consulting (Canada) Ltd., 200-1475 Ellis Street, Kelowna, British Columbia, Canada *kwebster@slrconsulting.com
[3]Transport Canada, 620-800 Burrard Street, Vancouver, British Columbia, Canada [4]Public Works and Government Services Canada, 641-800 Burrard Street, Vancouver, British Columbia, Canada

Abstract

SLR Consulting (Canada) Ltd. was retained by Public Works and Government Services Canada (PWGSC), on behalf of Transport Canada, to evaluate perfluorinated chemicals (PFCs) in a variety of environment media at two former fire-fighting training areas (FTAs). The PFC contamination is associated with the historical use of Aqueous Film Forming Foams (AFFF) during fire-fighting training exercises. Soil concentrations measured in the area of the former mockups exceeded site-specific ecological screening levels and consequently, SLR completed a vegetation community assessment and collected invertebrate, plant and small mammal liver tissue data for chemical analysis to evaluate risks to ecological receptors at the site.

Plant, earthworm and small mammal tissue data were used to estimate the dietary risk to herbivores, omnivores and carnivores consuming prey items containing perfluorooctane sulfonate (PFOS), perfluorohexane sulfonate (PFHxS) and/or total PFCs. Specifically, exposures to the American Robin, Deer Mouse and White-tailed Deer were estimated based on dietary requirements and soil, plant and/or earthworm concentrations. Exposures and risks to the American Kestrel, American Badger, Black Bear, Coyote, Red Fox, Western Toad and Eastern Yellow-bellied Racer were estimated based on all available tissue data and dietary requirements. No deer tissue data was available to estimate exposure to top carnivores such as the cougar and no food chain multipliers were available for these compounds to estimate biomagnification. However, the size of the contaminated area is small in comparison to the home range of top carnivores and risk is unlikely.

Hazard quotients for the American Robin and Deer Mouse were above 100. However, Deer Mouse and Vole liver tissue concentrations collected at the site were within the range of lowest observed effects levels reported in the literature and consequently, significant effects to populations of small terrestrial wildlife species inhabiting the site are considered unlikely. Hazard quotients (HQs) for the Black Bear, Coyote, Red Fox and American Badger were less than 1. However, HQs for the American Kestrel, Western Toad and Western Yellow-bellied Racer were above 1 but less than 3.4 for PFOS and total PFCs. Based on the low to moderate values of the calculated hazard quotients for the American Kestrel, Western Toad and Western Yellow-bellied Racer, and the high level of conservatism in the exposure estimates, the potential for adverse effects is expected to be low for both individual animals and overall populations.

Ecological risk assessment using mathematical estimations of bioaccumulation is possible for many compounds, however, evaluation of PFC risk to wildlife at present largely relies on tissue sampling. Estimation of risks to terrestrial wildlife is further complicated by a lack of toxicological reference values (TRVs) for many receptors.

Background

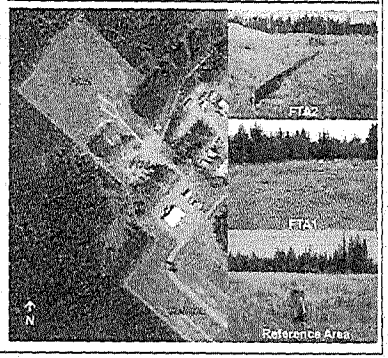
The former FTAs (FTA1 and FTA2) are located at an airport in the interior of British Columbia. FTA 1 was operational between 1972 and 1982 (south-central portion of the site) and FTA 2 operated between 1983 and 1992 (northern portion of the site). Each FTA formerly included an aircraft mockup (comprised of culvert sections), a fuelling station (aboveground fuel storage tank and pump) and fuel distribution lines. The fire training exercises reportedly consisted of flooding the aircraft mockups with fuel, igniting the fuel and completing fire suppression procedures using fire-fighting chemicals.

PFCs were identified as chemicals of potential concern due to the previous use of AFFF during the fire training activities at both FTA1 and FTA2. The extent of PFC soil contamination above direct contact targets is estimated at approximately 300 m² (0.03 ha) in FTA1 and 670 m² (0.067 ha) in FTA2.

The southern portion of the FTAs and surrounding airport lands to the south and east are zoned industrial (airport-related). The central and northern portions of the FTAs and surrounding lands to the north and west are zoned for agricultural land use. Although the majority of the site is zoned for agricultural use, probable future land use at the site will likely remain commercial and/or industrial (activities associated with the airport). Forested lands immediately border the site to the north, west, southwest and northeast. The nearest surface water body is a creek located approximately 880 meters (m) to the west of the former FTA 1 mockup and 700 m to the west of the former FTA 2 mockup.

Site Setting

Former Fire-Fighting Training Areas



Conceptual Site Plan

The FTAs are located at an operating airport and consist of cleared, bare land with a variety of grasses, herbaceous plants (legumes, sunflowers and mustards) and shrubs. The majority of the surrounding area is comprised of coniferous forest with moderate shrub cover. Use of the area around FTA 1 for equipment storage by the airport authority has resulted in significant compaction of site soils and a reduction in vegetation cover due to vehicle traffic.

Precipitation naturally infiltrates the site soils and groundwater is located approximately 6 m below grade. Surface water is not present at the FTAs or on the immediately adjacent lands; the nearest surface water body is located more than 700 m from the former mockups. Consequently, the primary medium of concern for terrestrial wildlife at the FTAs is soil.

Soil concentrations measured in the area of the former mockups exceeded site-specific ecological screening levels and consequently, SLR completed a vegetation community assessment and collected invertebrate, plant and small mammal liver tissue data for chemical analysis to evaluate risks to ecological receptors at the site.

Potential receptors of concern (ROC) were identified by reviewing provincial and federal species at risk, as well as determining non-listed species which may use the vegetation at the site as habitat. Potential exposure pathways evaluated by SLR included incidental soil ingestion and dietary exposure (plants, invertebrates and prey items).

Species representative of different ecological niches and trophic levels were selected for further evaluation, with species at risk selected preferentially. Species selected for exposure and risk quantification included:

- Deer Mouse (mammalian herbivore/invertivore)
- White-tailed Deer (mammalian herbivore)
- American Robin (avian invertivore)
- American Kestrel (avian predator)
- Black Bear and American Badger (mammalian omnivores)
- Coyote and Red Fox (mammalian carnivores)
- Western Toad (amphibian invertivore)
- Western Yellow-bellied Racer (synonym Racer) (reptilian carnivore)

Sampling Plan

Soil and Tissue Sampling

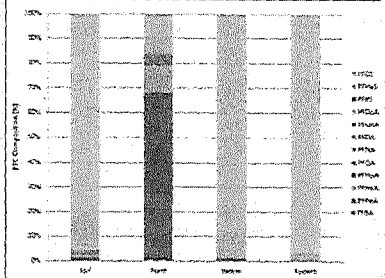
Surficial soil and invertebrate (i.e. earthworm) tissue samples were collected by manually advancing shallow test-pits using a hand-shovel or by using a backhoe. Earthworms were rinsed in PFC-free laboratory-supplied water but were not depurated prior to analysis. Aboveground plant tissue samples were manually collected and rinsed in PFC-free laboratory-supplied water prior to analysis. Voles and deer mice were collected using live-trapping techniques and euthanized with isoflurane. Animals were rinsed in PFC-free laboratory-supplied water prior to liver removal by dissection.

Vegetation Community Assessment

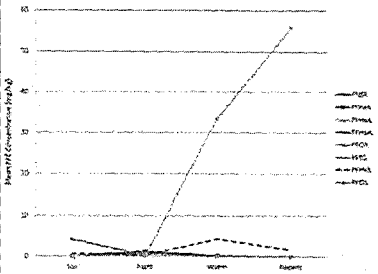
Vegetation abundance was evaluated by counting the number of stems in each survey plot (FTAs and reference area). Vegetation diversity was evaluated through plant identification in each of the survey plots.

Results

PFC Distribution in Soil and Biological Tissues



Mean PFC Concentrations in Soil and Biological Tissues



Vegetation Communities Assessment

Vegetation diversity and abundance was compared between FTA1, FTA2 and a reference location. As discussed, vehicle traffic at FTA1 has resulted in significant soil compaction and vegetation was noted to be sparse. For FTA2, no significant difference in vegetation was attributable to PFC contamination.

Risk Assessment

Conservative Exposure Assumptions

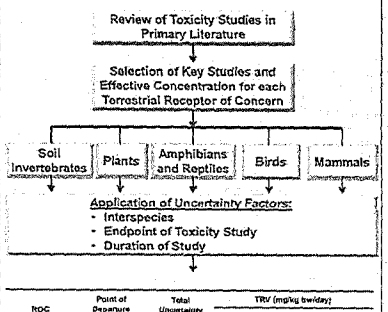
Exposure point concentrations (i.e. PFC concentrations at the point of contact with the receptor) were estimated using the 95% upper confidence limit of the mean (UCLM) calculated using ProUCL (Version 4.1). Adult body weights were based on the lowest of the reported male or female body weights. The site use factor assumed that the entire site was located within the home range of the receptor of concern and was estimated based on the portion of the home range that the site occupies.

Other conservative assumptions included:

- PFC concentrations in small birds and small herpetofauna were equal to those measured in small mammals.
- PFC concentrations in all plant material (i.e. flowers, fruit, roots and foliage) were equal to the concentrations in the aboveground plant tissue collected at the site.
- PFC concentrations in non-worm invertebrates (e.g. arthropods) were equal to those measured in earthworms at the site.

ROC	Total Average Daily Dose (mg/kg bw/day)		
	PFOS	PFHxS	Total PFCs
Deer Mouse	1.3E+01	1.4E+00	1.5E+01
White-tailed Deer	1.3E-04	6.1E-05	1.9E-04
American Robin	1.1E+01	1.3E+00	1.2E+01
American Kestrel	1.5E-01	1.1E-02	1.7E-01
Badger	1.2E-03	5.4E-05	1.4E-03
Black bear	1.1E-04	1.0E-05	1.4E-04
Red fox	6.5E-05	3.1E-04	0.0E-03
Coyote	2.4E-03	7.4E-05	2.6E-03
Western Toad	1.1E-01	1.4E-02	1.3E-01
Racer	1.0E-01	2.8E-02	1.1E-01

TRV Derivation



ROC	Point of Departure (mg/kg bw/day)	Total Uncertainty Factor	TRV (mg/kg bw/day)		
			PFOS	PFHxS	Total PFCs
Deer Mouse	PFOS LOAEL = 0.1	1	1.0E-01	1.0E-01	1.0E-01
	PFHxS LOAEL = 0.1	2			
White-tailed Deer	PFOS LOAEL = 0.1	10	1.0E-02	1.0E-02	1.0E-02
	PFHxS LOAEL = 0.1	20			
American Robin	PFOS LOAEL = 0.77	10	7.7E-02	7.7E-02	7.7E-02
American Kestrel	PFOS LOAEL = 0.77	10	7.7E-02	7.7E-02	7.7E-02
Badger	PFOS NOAEL = 0.1	10	1.0E-02	1.0E-02	1.0E-02
Black bear					
Red fox	PFHxS LOAEL = 0.3	20			
Coyote					
Western Toad	PFOS LOAEL = 0.77	20	3.8E-02	3.8E-02	3.8E-02
Racer					

Risk Assessment (continued)

Risk Characterization

$$HQ = \frac{ADD}{TRV}$$

ROC	HQ		
	PFOS	PFHxS	Total PFCs
Deer Mouse	1.3E+02	1.1E+01	1.5E+02
American Robin	1.4E+02	1.6E+01	1.6E+02
White-tailed Deer	1.3E-02	5.4E-03	1.0E-01
American Kestrel	2.0E+00	1.4E-01	2.2E+00
Badger	1.2E-01	3.6E-03	1.4E-01
Black bear	1.1E-02	6.9E-04	1.4E-02
Red fox	6.5E-01	1.4E-02	9.2E-01
Coyote	2.4E-01	4.9E-03	2.6E-01
Western Toad	3.8E+00	3.7E-01	3.4E+00
Racer	2.7E+00	6.9E-02	2.8E+00

Discussion and Conclusions

Evaluation of the risks associated with the PFC soil contamination has included the comparison of soil concentrations to risk-based remediation targets for ecological health. Due to the detection of soil concentrations above ecological screening levels, SLR completed a vegetation community assessment and collected plant, earthworm and small mammal liver tissue samples for chemical analysis. The vegetation community assessment concluded that the PFC concentrations detected in surface soils at the site did not cause significant adverse effects to populations of herbaceous plants.

Exposures to small mammals (e.g. Deer Mouse), small birds (e.g. American Robin) and large herbivorous mammals (e.g. White-tailed Deer) were estimated using the plant and earthworm tissue data. The estimated exposure for small mammals and small birds exceeded the TRVs for those receptors. Consequently, small mammals were captured and liver samples were submitted for chemical analysis to determine if PFC exposure would result in adverse effects to the population. Concentrations of PFOS and PFHxS in livers from small mammals collected on site were within the range, or less than, threshold effects concentrations that have been reported in peer-reviewed publications. As a result, significant population level effects to small terrestrial wildlife are considered unlikely.

As a result of the apparent biomagnification of PFCs through the trophic levels already evaluated, exposures to avian predatory species (American Kestrel), mammalian omnivores (Badger, Black Bear), mammalian carnivores (Red Fox, Coyote), amphibian invertivores (Western Toad) and reptilian carnivores (Racer) were estimated using PFC concentrations in small mammals, earthworms, plants, and soil collected on site. Based on the low to moderate values of the calculated hazard quotients, and the high level of conservatism in the exposure estimates, the potential for adverse effects is expected to be low for both individual animals and overall populations.

Transports Canada / Transport Canada

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

SLR

Transport Canada
Transports Canada

Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada

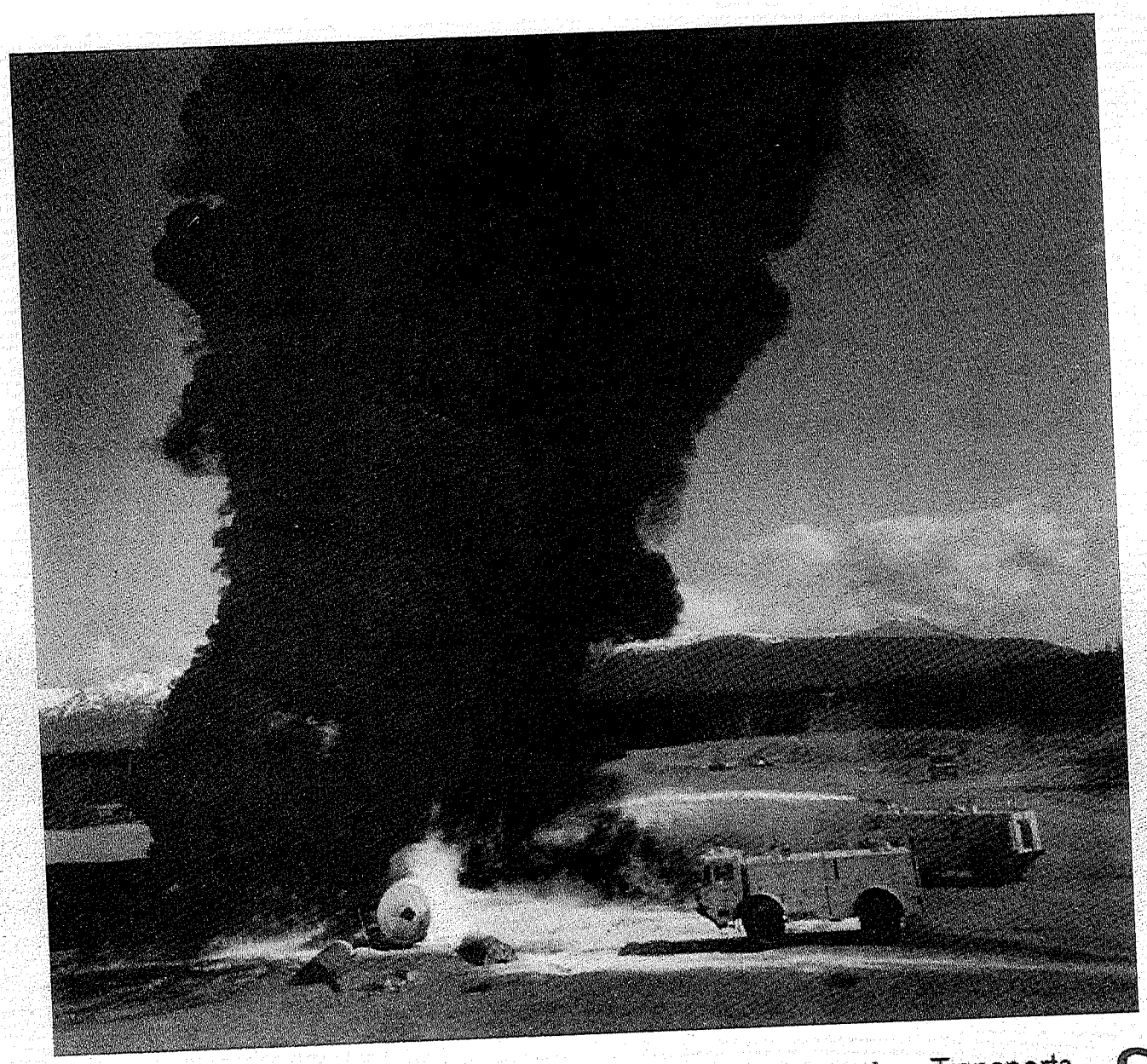
SLR
global environmental solutions

Evaluation of Groundwater Transport of Perfluorinated Chemicals at a Former Fire-Fighting Training Area

Lindsay Paterson – SLR Consulting (Canada) Ltd.
Ian Mitchell – SLR Consulting (Canada) Ltd.
Ian Chatwell – Transport Canada
Raman Birk - PWGSC

Overview

- Introduction to AFFF and PFCs
- Physical-Chemical Properties/Partitioning
- Groundwater Investigations
- Analytical Modeling



Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

Transport Canada

Transports Canada

SLR

Acronyms

- AFFF – aqueous film-forming foam
- PFC – perfluorinated chemical
- PFSA – perfluorosulfonate
- PFCA – perfluorocarboxylate
- FTS – fluorotelomer sulfonate

Acronyms (continued)

- PFOS – perfluorooctane sulfonate
- PFHxS – perfluorohexane sulfonate
- PFBS – perfluorobutane sulfonate
- PFNA – perfluorononanoate
- PFOA – perfluorooctanoate
- PFHpA – perfluoroheptanoate
- PFHxA – perfluorohexanoate
- PFPeA - perfluoropentanoate
- PFBA - perfluorobutanoate

AFFF

- 1981 Transport Canada Guidelines:
  - 680 L AFFF annually for 1st year firefighter
  - 340 L AFFF annually for other firefighters
- Current guidelines do not specify AFFF training quantities
- PFC content in AFFF estimated to range from 0.5 % (Hekster et al, Vecitis et al) to 16% (Paul et al)

Types of PFCs in AFFF

- Perfluorosulfonates (PFSAs): fully fluorinated carbon chains with sulfonate end group (e.g. PFOS)
- Perfluorocarboxylates (PFCAs): fully fluorinated carbon chains with carboxylate end group (e.g. PFOA)
- Fluorotelomer Sulfonates (FTS): fully fluorinated carbon chain connected to alkyl chain with sulfonate end group (e.g. 6:2 FTS)

Properties – PFSAs/PFCAs

- Generally in ionized form
- Solubility decreases and sorption increases with increasing chain length
- PFSAs more sorptive than PFCAs
- Non-volatile
- Can sorb to organic carbon, soil particles, iron oxides
- No evidence of biodegradation, photolysis

Groundwater Investigations

Taylor, Sheree L.

From: Joe Minor [jminor@cogeco.ca]
Sent: August 26, 2012 11:56 AM
To: clerk@hamilton.ca
Subject: PFOS: Transport Canada Annex 5, partB
Attachments: Annex5B.pdf

Please include this communication in the next official (publicly accessible) information package for Hamilton City Council.

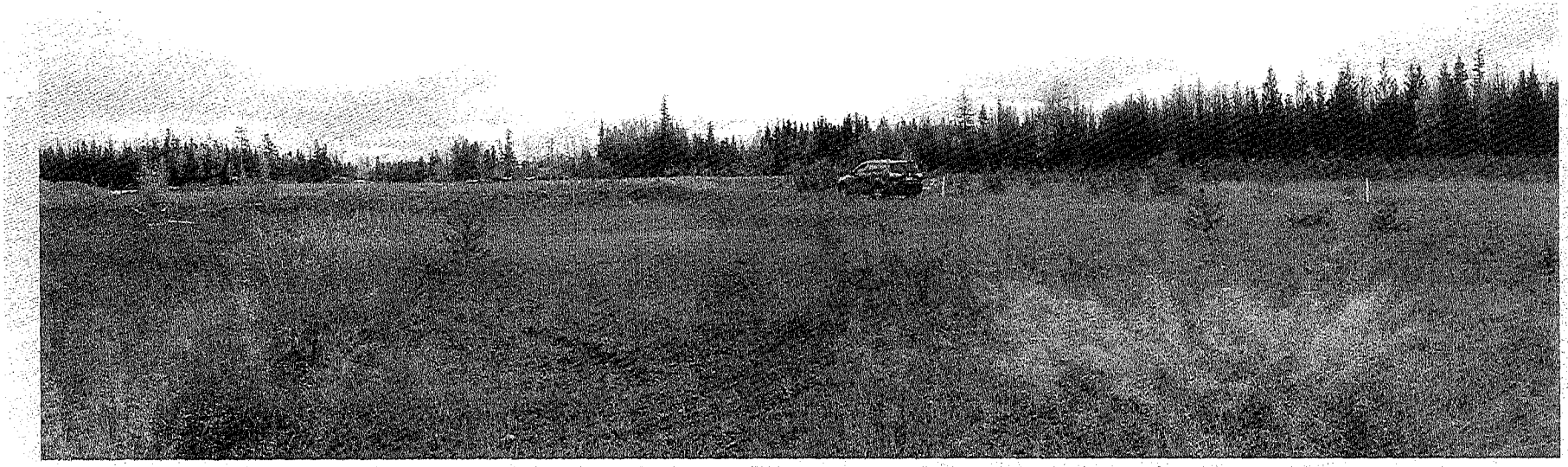
This attachment contains supplemental information (Annex 5, part B) from the Minister of Transport.

Thanks,

Joe Minor

Groundwater Investigations

- Initial groundwater testing: 2006
- Groundwater delineation: 2008-2011
- Groundwater modeling: 2008-2011



Public Works and Government Services Canada
Travaux publics et Services gouvernementaux Canada
Transport Canada
Transports Canada
SLR

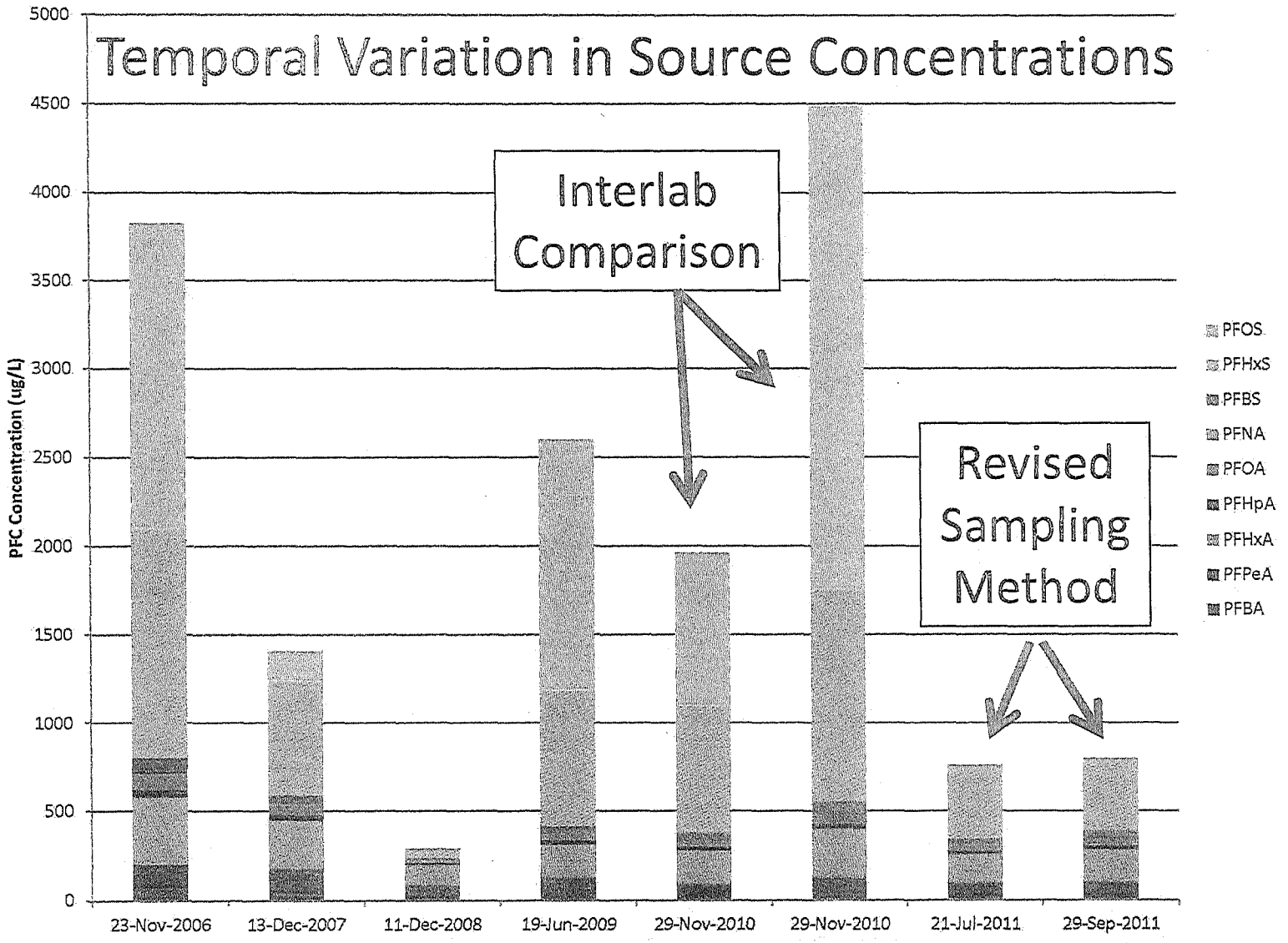
Groundwater Targets

Drinking Water Protection

- PFOS – 0.3 ug/L (Health Canada)
- PFOA – 0.7 ug/L (Health Canada)
- PFBS – 7 ug/L (Minnesota Dept. of Health)
- PFBA – 7 ug/L (Minnesota Dept. of Health)

Aquatic Life Protection

- PFOS – 50 ug/L (SLR derived value based on direct exposure)



Public Works and Government Services Canada

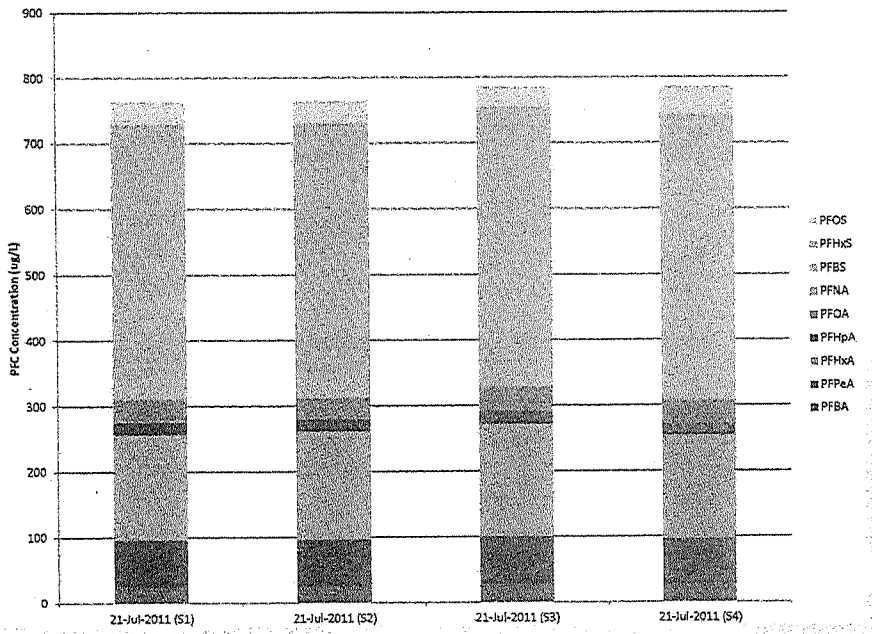
Travaux publics et Services gouvernementaux Canada

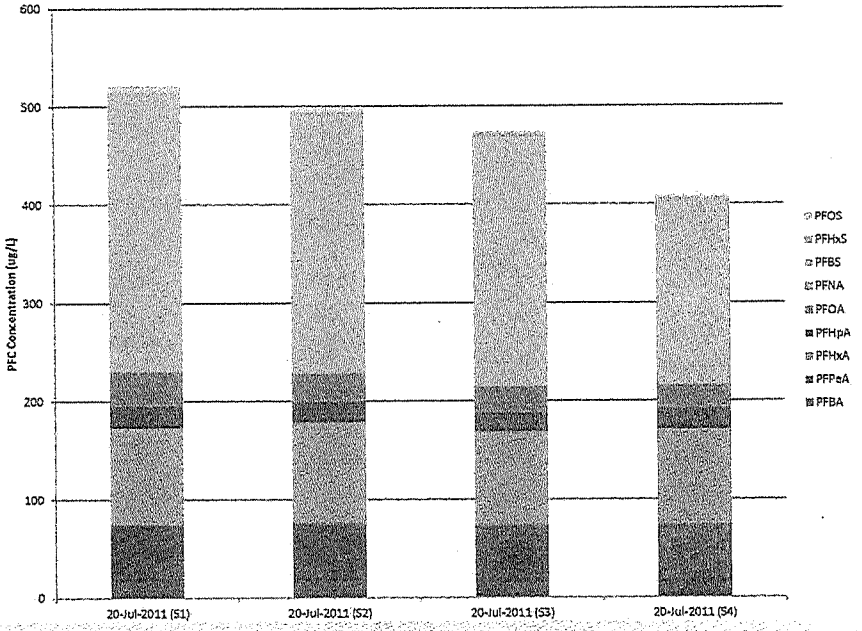
Transport Canada

Transports Canada

SLR

Bailer Sampling Study





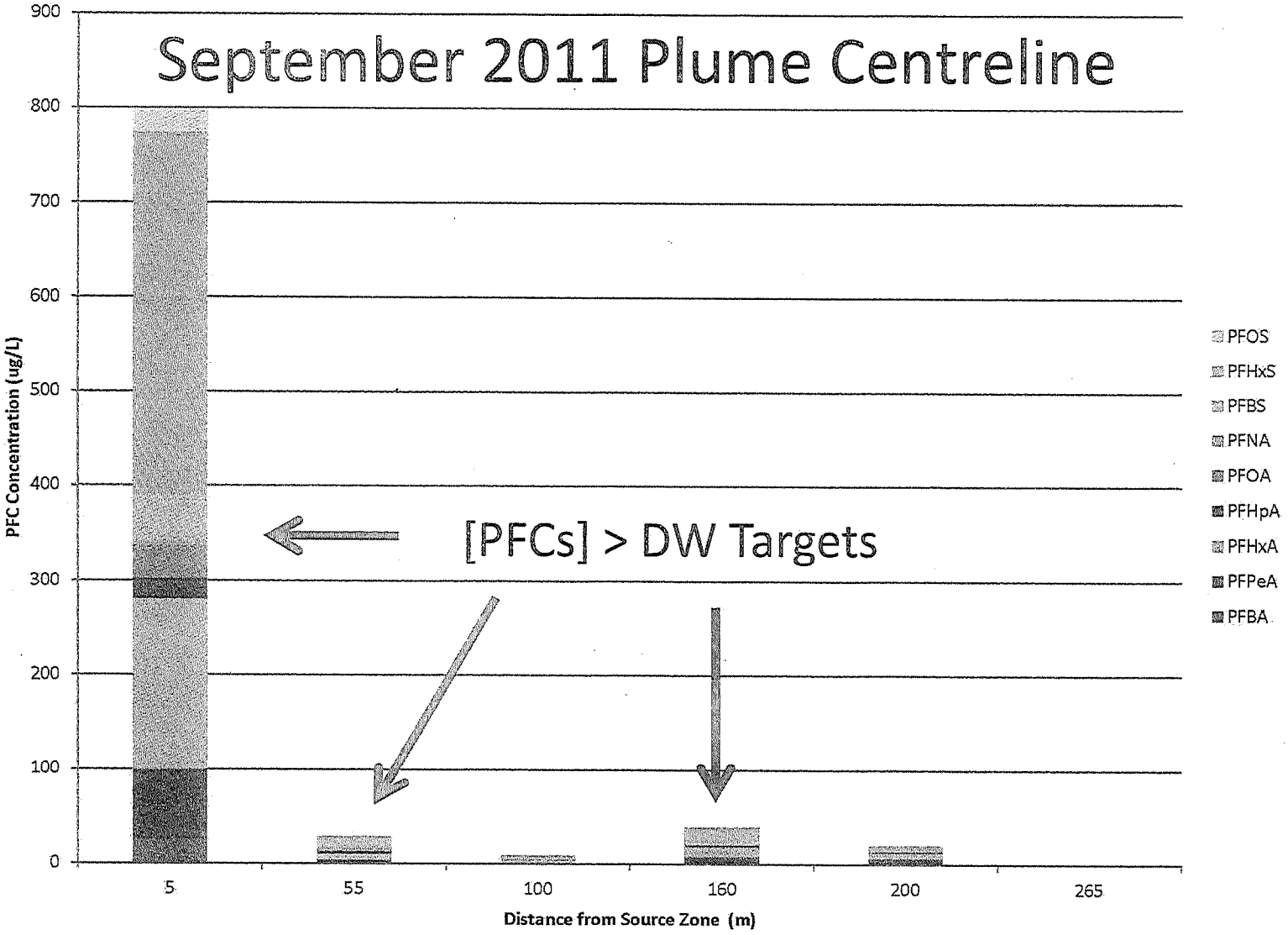
Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

Transport Canada

Transports Canada

SLR



Public Works and Government Services Canada

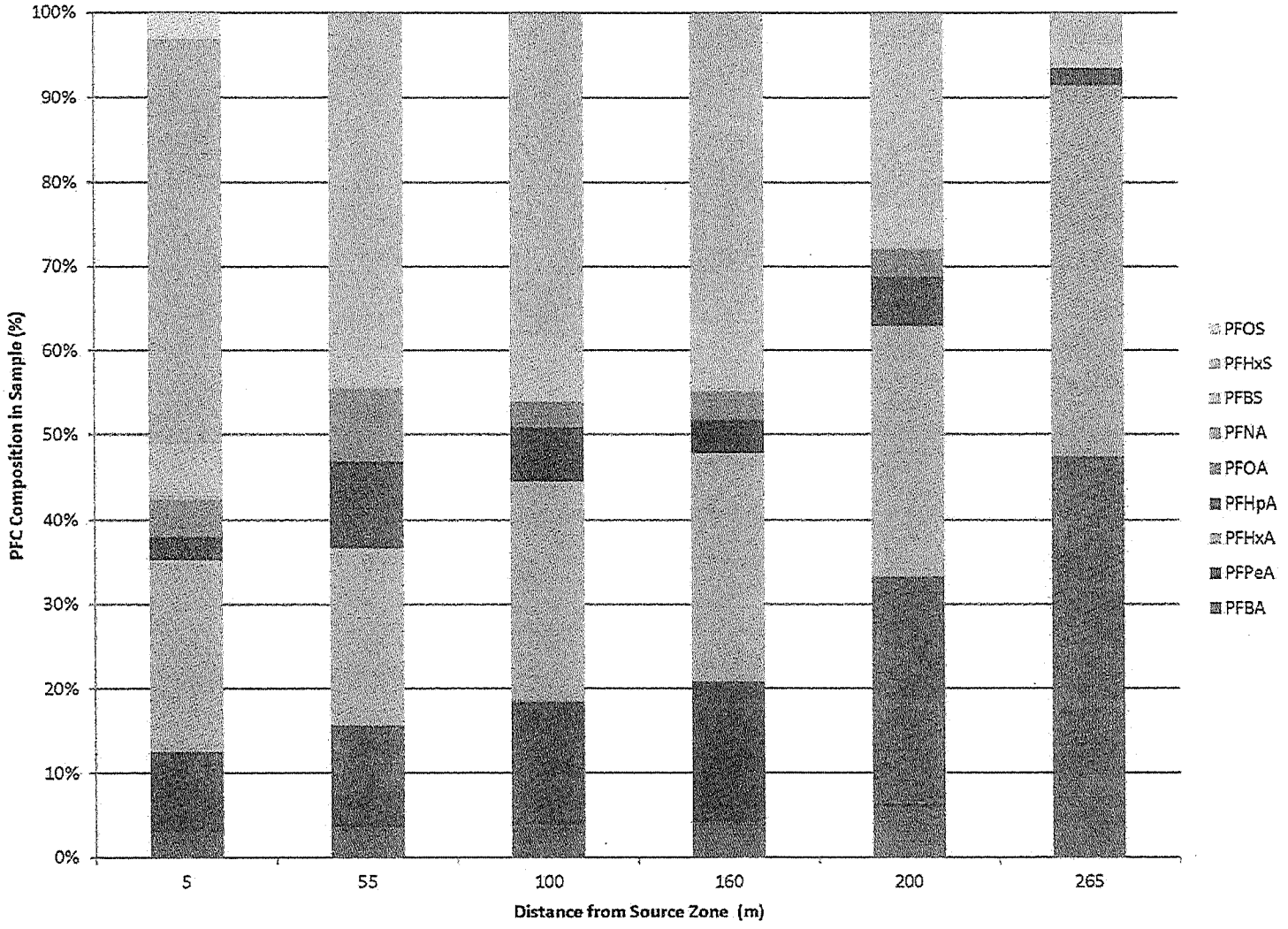
Travaux publics et Services gouvernementaux Canada

Transport Canada

Transports Canada

SLR

September 2011 Plume Centreline



Public Works and Government Services Canada

Travaux publics et Services gouvernementaux Canada

Transport Canada

Transports Canada

SLR

PFC Groundwater Modeling

- EPA BIOSCREEN (no biodegradation)
- K_{oc} values estimated from Higgins and Luthy (2006)
- Results used to locate delineation wells, to estimate the current extent of the plumes and to predict the arrival date of the plume at specified down-gradient locations

Conclusions

- Near source PFHxS and PFOS groundwater data collected prior to 2011 may not be reliable due to stratification effects
- Bailer sampling provides consistent results throughout the water column
- PFCAs are more mobile than PFSAs and should be considered in hydrogeological evaluations
- PFC plumes will be more extensive than other contaminant plumes associated with fire training areas (i.e. hydrocarbons) and will likely be the risk-management driver at the site

References

- AXYS. 2010. Subsampling Heterogeneity of High Surfactant Activity Aqueous Samples: Implications for Perfluorinated Compound Analysis.. SETAC Portland November 11, 2010.
- Health Canada. 2010a. Drinking Water Guidance Value Perfluorooctanoic Acid (PFOA).
- Health Canada. 2010b. Drinking Water Guidance Value Perfluorooctane Sulfonate (PFOS).
- Hekster, F.M., P. de Voogt, A.M.C.M. Pijnenburg and R.W.P.M. Laane, 2002. Perfluoroalkylated substances: Aquatic Environmental Assessment, Report RIKZ/2002.043.
- Higgins, C.P. and R.G. Luthy, 2006. Sorption of Perfluorinated Surfactants on Sediments. Environmental Science and Technology, 40: 7251-56
- Minnesota Department of Health (MDH). 2008. Health Risk Limits for Perfluorochemicals, Minnesota Department of Health, Final Report.
- Minnesota Department of Health (MDH). 2009. Health Based Guidance for Groundwater Health Risk Assessment Unit, Environmental Health Division: Perfluorobutane Sulfonate.
- Paul, A.G., K.C. Jones and A.J. Sweetman, 2009. A First Global Production, Emission, and Environmental Inventory for Perfluorooctane Sulfonate. Environmental Science and Technology 43: 386-392.
- Transport Canada, 1981. Airport Emergency Services Firefighter Training, AK-12-06-002.
- Vecitis, C.D., Y. Wang, J. Cheng, H. Park, B.T. Mader and M.R. Hoffmann, 2010. Sonochemical Degradation of Perfluorooctanesulfonate in Aqueous Film-Forming Foams. Environmental Science and Technology 44: 432-438.

Contact Information

- Lindsay Paterson: lpaterson@slrconsulting.com
- Ian Mitchell: imitchell@slrconsulting.com
- Ian Chatwell: Ian.Chatwell@tc.gc.ca
- Raman Birk: Raman.Birk@pwgsc-tpsgc.gc.ca

Taylor, Sheree L.

From: Joe Minor [jminor@cogeco.ca]
Sent: August 26, 2012 11:57 AM
To: clerk@hamilton.ca
Subject: Re: PFOS: Transport Canada Annex 5, parts 6 and 7A
Attachments: Annex6and7A.pdf

Please include this communication in the next official (publicly accessible) information package for Hamilton City Council.

This attachment contains supplemental information (Annex 6 and 7A) from the Minister of Transport.

Thanks,

Joe Minor

ANNEX 6
LIST OF SITES WITH CONFIRMED PRESENCE OF PERFLUOROOCTANE SULFONATE (PFOS)

Sites with Confirmed Presence of Perfluorooctane Sulfonate (PFOS)	
Province	**Airport Name**
BC	Prince George
BC	Victoria
BC	Campbell River
BC	Williams Lake
BC	Abbotsford
BC	Sandspit
NU	Cambridge Bay
MB	Winnipeg
YT	Watson Lake
ON	London
ON	Ottawa
ON	Thunder Bay
ON	Sault Ste. Marie
ON	Hamilton
NB	Fredericton
NS	Halifax
NL	St. John's
NT	Inuvik

ANNEX 7
PFOS DATA – LONDON AIRPORT

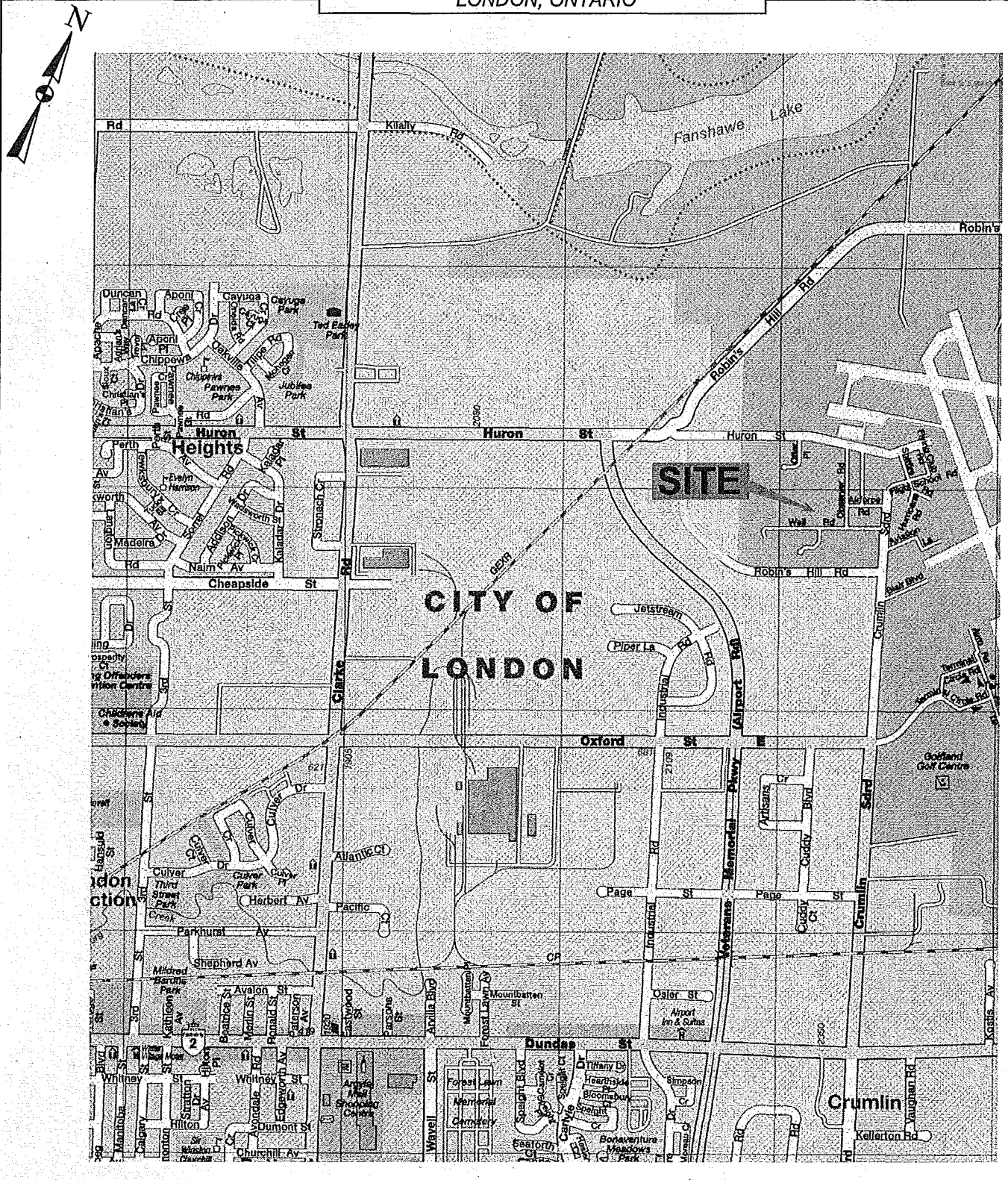
TERRAPEX
Environmental Ltd.

SITE LOCATION

FORMER FIREFIGHTER TRAINING AREAS
LONDON INTERNATIONAL AIRPORT
LONDON, ONTARIO

CLIENT

Public Works and Government Services Canada



PROJECT #	CB485.00
DATE	MARCH 2011
DRAWN	PBR
CHECKED	GLL
DRAWING #	FIGURE 1

NOTE: DRAWING TAKEN FROM MAPART
WESTERN ONTARIO ATLAS, 2008 EDITION PAGE 106.

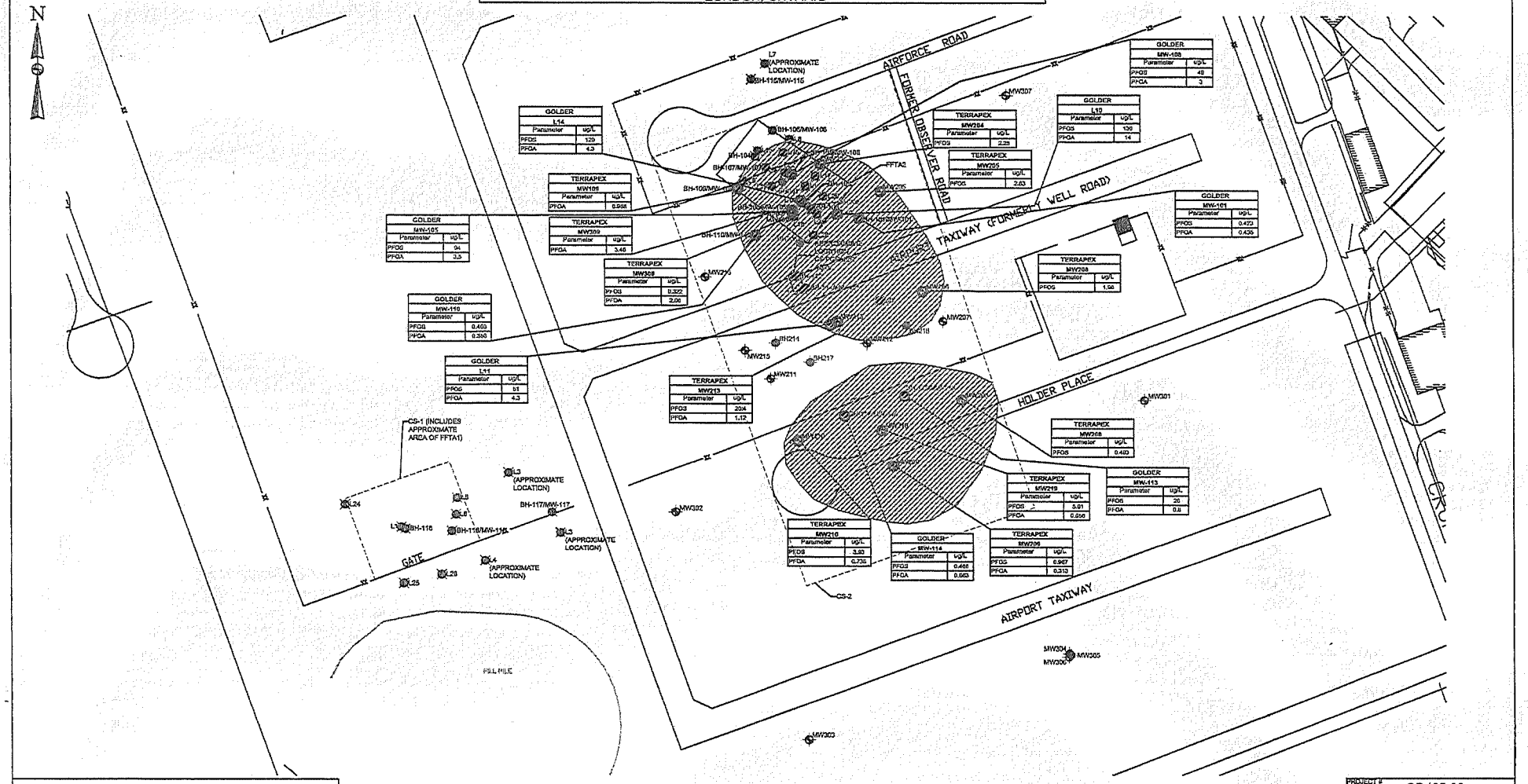
TERRAPEX
Environmental Ltd.

GROUNDWATER EXCEEDENCES - PFOS AND PFOA

FORMER FIREFIGHTER TRAINING AREAS
LONDON INTERNATIONAL AIRPORT
LONDON, ONTARIO

CLIENT

Public Works and Government Services Canada



LEGEND

PFOS Perfluoro-1-octanesulfonate
PFOA Perfluoro-n-octanoic acid

STANDARD	
Parameter	ug/L
PFOS	0.3
PFOA	0.3

- BOREHOLE
- MONITORING WELL
- PREVIOUS SAMPLE LOCATION
- EXCEEDS GUIDELINE
- ESTIMATED EXTENT OF CONTAMINATION

NOTE: CREATED FROM FIELD OBSERVATIONS AND MEASUREMENTS

PROJECT #	CB485.00
SCALE	AS SHOWN
DATE	MARCH 2011
DRAWN	PBR
CHECKED	GLL
DRAWING #	FIGURE 7

TABLE 5 SOIL ANALYTICAL RESULTS - PFOS AND PFOA
Former Firefighting Training Areas
London International Airport, London, Ontario

Terrapex Sample Name		Units	WILLIAMS LAKE RISK-BASED CRITERIA [1]	MDL [2]	MW213-3	BH217-3	BH218-2	Lab Blank Laboratory Replicate
Sampling Date		-	-	-	22-Sep-10	21-Sep-10	21-Sep-10	29-Sep-10
Sample Depth		m bg	-	-	1.5 - 2.1	1.5 - 2.1	0.8 - 1.4	-
CSV Reading	(Gastechtor- Methane Elimination)	see note	ns	ns	10 ppm	95 ppm	10 ppm	-
CSV Reading	(Photoionization Detector)	see note	ns	ns	0.9 ppm	18.8 ppm	2.2 ppm	-
PFOS		µg/g	1.3	0.0967	0.109	0.48	0.00137	< 0.0002
PFOA		µg/g	ns	0.193	0.00102	0.00193	0.028	< 0.0001

[1] Site Specific Risk Based Remediation Target developed to protect human health (1999)
[2] Minimum Detectable Limit
PFOS Perfluoro-1-octanesulfonate
PFOA Perfluoro-n-octanoic acid
ns No standard or Criteria (as applicable)
m bg Metres below grade
CSV Reading Combustible soil vapour reading (ppm or % LEL)
ppm Parts per million (by volume)
% LEL Percent of the lower explosive limit
µg/g Micrograms per gram
BOLD Exceeds Williams Lake Risk-Based Criteria

TABLE 10 WATER ANALYTICAL RESULTS - PFOS AND PFOA
Former Firefighting Training Areas
London International Airport, London, Ontario

Terrapex Sample Name		Units	MDoH GUIDELINE [1]	WILLIAMS LAKE RISK-BASED CRITERIA [2]	MDL [3]	MW204	MW205	MW206	MW207	MW208
Sampling Date		-	-	-	-	29-Sep-10	29-Sep-10	29-Sep-10	30-Sep-10	30-Sep-10
Monitoring Well Depth		-	-	-	-					
Sample Location		m bg	-	-	-	MW204	MW205	MW206	MW207	MW208
CSV Reading	(Gastechtor- Methane Elimination)	see note	ns	ns	ns	100 ppm	290 ppm	30% LEL	10 ppm	10% LEL
CSV Reading	(Photoionization Detector)	see note	ns	ns	ns	0.2 ppm	0.0 ppm	0.0 ppm	0.0 ppm	0.0 ppm
PFOS		µg/L	0.3	0.4	0.002	**2.28**	**2.63**	**1.95**	0.113	**0.463**
PFOA		µg/L	0.3	-	0.001	0.127	0.247	0.162	0.0694	0.18

1 Minnesota Department of Health *Health Based Rules and Guidelines for Groundwater* (2009)
2 Site Specific Risk Based Remediation Target developed to protect human health (1999)
3 Minimum Detectable Limit
PFOS Perfluoro-1-octanesulfonate
PFOA Perfluoro-n-octanoic acid
ns No standard or Criteria (as applicable)
m bg Metres below grade
CSV Reading Combustible soil vapour reading (ppm or % LEL)
ppm Parts per million (by volume)
% LEL Percent of the lower explosive limit
µg/g Micrograms per gram
BOLD Exceeds MDoH Guideline
VALUE Exceeds Williams Lake Risk-Based Criteria

TABLE 10 WATER ANALYTICAL RESULTS - PFOS AND PFOA (CONTINUED)
Former Firefighting Training Areas
London International Airport, London, Ontario

Terrapex Sample Name	Units	MDoH GUIDELINE [1]	WILLIAMS LAKE RISK-BASED CRITERIA [2]	MDL [3]	MW209	MW210	MW211	MW213	MW215
Sampling Date	-	-	-	-	30-Sep-10	30-Sep-10	30-Sep-10	30-Sep-10	30-Sep-10
Monitoring Well Depth	-	-	-	-					
Sample Location	m bg	-	-	-	MW209	MW210	MW211	MW213	MW215
CSV Reading (Gastechtor- Methane Elimination)	see note	ns	ns	ns	350 ppm	40 ppm	290 ppm	300 ppm	10 ppm
CSV Reading (Photoionization Detector)	see note	ns	ns	ns	0.1 ppm	0.0 ppm	0.0 ppm	0.1 ppm	0.0 ppm
PFOS	µg/L	0.3	0.4	0.002	**0.967**	**3.93**	0.169	**20.4**	0.105
PFOA	µg/L	0.3	-	0.001	**0.313**	**0.736**	0.0758	**1.12**	0.0872

1 Minnesota Department of Health *Health Based Rules and Guidelines for Groundwater* (2009)
2 Site Specific Risk Based Remediation Target developed to protect human health (1999)
3 Minimum Detectable Limit
PFOS Perfluoro-1-octanesulfonate
PFOA Perfluoro-n-octanoic acid
ns No standard or Criteria (as applicable)
m bg Metres below grade
CSV Reading Combustible soil vapour reading (ppm or % LEL)
ppm Parts per million (by volume)
% LEL Percent of the lower explosive limit
µg/g Micrograms per gram
BOLD Exceeds MDoH Guideline
VALUE Exceeds Williams Lake Risk-Based Criteria

Taylor, Sheree L.

From: Joe Minor [jminor@cogeco.ca]
Sent: August 26, 2012 12:00 PM
To: clerk@hamilton.ca
Subject: PFOS: Transport Canada Annex 7B
Attachments: Annex7B.pdf

Please include this communication in the next official (publicly accessible) information package for Hamilton City Council.

This attachment contains supplemental information (Annex 7, part B) from the Minister of Transport.

Thanks,

Joe Minor

TABLE 10 WATER ANALYTICAL RESULTS - PFOS AND PFOA (CONTINUED)
Former Firefighting Training Areas
London International Airport, London, Ontario

Terrapex Sample Name	Units	MDoH GUIDELINE [1]	WILLIAMS LAKE RISK-BASED CRITERIA [2]	MDL [3]	MW216	MW219	MW220 Field Duplicate of MW219	Field Blank1	Trip Blank1
Sampling Date	-	-	-	-	30-Sep-10	30-Sep-10	30-Sep-10	30-Sep-10	30-Sep-10
Monitoring Well Depth	-	-	-	-					
Sample Location	m bg	-	-	-	MW216	MW219	MW220	Field Blank1	Trip Blank1
CSV Reading (Gastechtor- Methane Elimination)	see note	ns	ns	ns	190 ppm	40 ppm	40 ppm	-	-
CSV Reading (Photoionization Detector)	see note	ns	ns	ns	0.2 ppm	0.0 ppm	0.0 ppm	-	-
PFOS	µg/L	0.3	0.4	0.002	0.018	**5.91**	**6.59**	< 0.002	< 0.00202
PFOA	µg/L	0.3	-	0.001	0.0415	**0.656**	**0.634**	< 0.001	< 0.00101

1 Minnesota Department of Health *Health Based Rules and Guidelines for Groundwater* (2009)
2 Site Specific Risk Based Remediation Target developed to protect human health (1999)
3 Minimum Detectable Limit
PFOS Perfluoro-1-octanesulfonate
PFOA Perfluoro-n-octanoic acid
ns No standard or Criteria (as applicable)
m bg Metres below grade
CSV Reading Combustible soil vapour reading (ppm or % LEL)
ppm Parts per million (by volume)
% LEL Percent of the lower explosive limit
µg/g Micrograms per gram
BOLD Exceeds MDoH Guideline
VALUE Exceeds Williams Lake Risk-Based Criteria

TABLE 10 WATER ANALYTICAL RESULTS - PFOS AND PFOA (CONTINUED)
Former Firefighting Training Areas
London International Airport, London, Ontario

Terrapex Sample Name	Units	MDoH GUIDELINE [1]	WILLIAMS LAKE RISK-BASED CRITERIA [2]	MDL [3]	Lab Blank Laboratory Replicate	MW106	MW109	MW301	MW302
Sampling Date	-	-	-	-	6-Oct-10	2-Dec-10	2-Dec-10	2-Dec-10	2-Dec-10
Monitoring Well Depth	-	-	-	-				3.7 m	4.6 m
Sample Location	m bg	-	-	-	Lab Blank	MW106	MW109	MW301	MW302
CSV Reading (Gastechtor- Methane Elimination)	see note	ns	ns	ns	-	90 ppm	10 ppm	140 ppm	150 ppm
CSV Reading (Photoionization Detector)	see note	ns	ns	ns	-	0.0 ppm	0.0 ppm	0.1 ppm	0.2 ppm
PFOS	µg/L	0.3	0.4	0.002	< 0.002	0.0097	0.265	0.0314	0.0545
PFOA	µg/L	0.3	-	0.001	< 0.001	0.0630	**0.988**	0.0449	0.132

1 Minnesota Department of Health *Health Based Rules and Guidelines for Groundwater* (2009)
2 Site Specific Risk Based Remediation Target developed to protect human health (1999)
3 Minimum Detectable Limit
PFOS Perfluoro-1-octanesulfonate
PFOA Perfluoro-n-octanoic acid
ns No standard or Criteria (as applicable).
m bg Metres below grade
CSV Reading Combustible soil vapour reading (ppm or % LEL)
ppm Parts per million (by volume)
% LEL Percent of the lower explosive limit
µg/g Micrograms per gram
BOLD Exceeds MDoH Guideline
VALUE Exceeds Williams Lake Risk-Based Criteria

TABLE 10 WATER ANALYTICAL RESULTS - PFOS AND PFOA (CONTINUED)
Former Firefighting Training Areas
London International Airport, London, Ontario

Terrapex Sample Name	Units	MDoH GUIDELINE [1]	WILLIAMS LAKE RISK-BASED CRITERIA [2]	MDL [3]	MW303	MW304	MW305	MW306	MW307
Sampling Date	-	-	-	-	2-Dec-10	2-Dec-10	2-Dec-10	2-Dec-10	2-Dec-10
Monitoring Well Depth	-	-	-	-	3.1 m	3.7 m	10.1 m	6.1 m	3.7 m
Sample Location	m bg	-	-	-	MW303	MW304	MW305	MW306	MW307
CSV Reading (Gastechtor- Methane Elimination)	see note	ns	ns	ns	5% LEL	120 ppm	12% LEL	5 ppm	<5 ppm
CSV Reading (Photoionization Detector)	see note	ns	ns	ns	0.3 ppm	0.0 ppm	2.1 ppm	0.0 ppm	0.0 ppm
PFOS	µg/L	0.3	0.4	0.002	0.0453	0.0052	0.0279	-	0.0088
PFOA	µg/L	0.3	-	0.001	0.0171	0.0070	0.0046	-	0.0091

1 Minnesota Department of Health *Health Based Rules and Guidelines for Groundwater* (2009)
2 Site Specific Risk Based Remediation Target developed to protect human health (1999)
3 Minimum Detectable Limit
PFOS Perfluoro-1-octanesulfonate
PFOA Perfluoro-n-octanoic acid
ns No standard or Criteria (as applicable)
m bg Metres below grade
CSV Reading Combustible soil vapour reading (ppm or % LEL)
ppm Parts per million (by volume)
% LEL Percent of the lower explosive limit
µg/g Micrograms per gram
BOLD Exceeds MDoH Guideline
VALUE Exceeds Williams Lake Risk-Based Criteria

TABLE 10 WATER ANALYTICAL RESULTS - PFOS AND PFOA (CONTINUED)
Former Firefighting Training Areas
London International Airport, London, Ontario

Terrapex Sample Name	Units	MDoH GUIDELINE [1]	WILLIAMS LAKE RISK-BASED CRITERIA [2]	MDL [3]	MW308	MW309	MW310 Field Duplicate of MW309	MW311 Field Blank	Trip Blank
Sampling Date	-	-	-	-	2-Dec-10	2-Dec-10	2-Dec-10	2-Dec-10	2-Dec-10
Monitoring Well Depth	-	-	-	-	10.1 m	6.1 m	-	-	-
Sample Location	m bg	-	-	-	MW308	MW309	MW309	Field Blank	Trip Blank
CSV Reading (Gastechtor- Methane Elimination)	see note	ns	ns	ns	7% LEL	8% LEL	8% LEL	-	-
CSV Reading (Photoionization Detector)	see note	ns	ns	ns	108.5 ppm	368.2 ppm	368.2 ppm	-	-
PFOS	µg/L	0.3	0.4	0.002	**0.322**	0.146	0.142	<0.000991	0.00287
PFOA	µg/L	0.3	-	0.001	**2.06**	**3.46**	**3.21**	<0.00198	<0.000997

1 Minnesota Department of Health *Health Based Rules and Guidelines for Groundwater* (2009)
2 Site Specific Risk Based Remediation Target developed to protect human health (1999)
3 Minimum Detectable Limit
PFOS Perfluoro-1-octanesulfonate
PFOA Perfluoro-n-octanoic acid
ns No standard or Criteria (as applicable)
m bg Metres below grade
CSV Reading Combustible soil vapour reading (ppm or % LEL)
ppm Parts per million (by volume)
% LEL Percent of the lower explosive limit
µg/g Micrograms per gram
BOLD Exceeds MDoH Guideline
VALUE Exceeds Williams Lake Risk-Based Criteria

TABLE 10 WATER ANALYTICAL RESULTS - PFOS AND PFOA (CONTINUED)
Former Firefighting Training Areas
London International Airport, London, Ontario

Terrapex Sample Name	Units	MDoH GUIDELINE [1]	WILLIAMS LAKE RISK-BASED CRITERIA [2]	MDL [3]	Lab Blank Laboratory Replicate
Sampling Date	-	-	-	-	-
Monitoring Well Depth	-	-	-	-	-
Sample Location	m bg	-	-	-	Lab Blank
CSV Reading (Gastechtor- Methane Elimination)	see note	ns	ns	ns	-
CSV Reading (Photoionization Detector)	see note	ns	ns	ns	-
PFOS	µg/L	0.3	0.4	0.002	< 0.001
PFOA	µg/L	0.3	-	0.001	< 0.002

1 Minnesota Department of Health *Health Based Rules and Guidelines for Groundwater* (2009)
2 Site Specific Risk Based Remediation Target developed to protect human health (1999)
3 Minimum Detectable Limit
PFOS Perfluoro-1-octanesulfonate
PFOA Perfluoro-n-octanoic acid
ns No standard or Criteria (as applicable)
m bg Metres below grade
CSV Reading Combustible soil vapour reading (ppm or % LEL)
ppm Parts per million (by volume)
% LEL Percent of the lower explosive limit
µg/g Micrograms per gram
BOLD Exceeds MDoH Guideline
VALUE Exceeds Williams Lake Risk-Based Criteria

TABLE IV

ANALYTICAL RESULTS FOR PERFLUROCTANESULFONIC ACID AND ITS SALTS IN BOREHOLE SOIL SAMPLES

Phase III Environmental Site Assessment
Former Fire Training Area 2
London Airport
London, Ontario

	RESULTS[1]							
Sample Identification:	BH-101-2B	BH-102-2B	BH-103-1C	BH-103-1C DUP	BH-104-1D	BH-105-2A	BH-106-1B	WILLIAMS
Sample Date:	05-Jan-10	05-Jan-10	05-Jan-10	05-Jan-10	06-Jan-10	05-Jan-10	06-Jan-10	LAKE RISK
Sample Depth[2]:	2.4 to 2.9	1.8 to 2.6	0.9 to 1.3	0.9 to 1.3	1.2 to 1.5	1.5 to 1.8	0.8 to 1.5	BASED
Sample Description:	SAND	SAND & GRAVEL	SILT	SILT	SAND	SILTY SAND	SAND	TARGET[1,3]
PARAMETER								
Perfluoro-1-Octanesulfonate	76	250	130	99	400	210	960	1300
Perfluoro-n-Octanoic Acid	<2.5	2.6	40	22	6.7	7.7	7.1	-

	RESULTS[1]							
Sample Identification:	BH-107-2B	BH-108-2B	BH-109-1C	BH-110-1C	BH-113-2A	BH-114-2A	BH-115-3B	WILLIAMS
Sample Date:	06-Jan-10	06-Jan-10	06-Jan-10	07-Jan-10	07-Jan-10	07-Jan-10	08-Jan-10	LAKE RISK
Sample Depth[2]:	2.0 to 2.3	1.8 to 2.3	0.8 to 1.5	1.0 to 1.5	1.5 to 2.3	1.5 to 2.3	3.7 to 4.3	BASED
Sample Description:	SAND & GRAVEL	SAND & GRAVEL	SAND	SILTY SAND	SAND	SAND	SAND & GRAVEL	TARGET[1,3]
PARAMETER								
Perfluoro-1-Octanesulfonate	58	70	220	35	50	41	<25	1300
Perfluoro-n-Octanoic Acid	<2.5	<2.5	3.6	<2.5	<2.5	<2.5	<2.5	-

NOTES:

1. All values shown as micrograms per kilogram (ug/kg) unless otherwise noted.
2. All depths are expressed as metres below ground surface (mbgs).
3. Value derived from 1999 site specific risk assessment as the most stringent target to protect ecological health. For guidance only.
4. "<" indicates concentration is below the laboratory detection limit.
5. Values in **bold** greater than the risk based soil target developed for the Williams Lake Airport.
6. BH-103-1C DUP and BH-116-1C DUP are duplicates of BH-103-1C and BH-116-1C, respectively. Samples with an unacceptable Relative Percent Difference (RPD) are double underlined.
7. Table to be read in conjunction with accompanying report.

ANALYTICAL RESULTS FOR PERFLUROCTANESULFONIC ACID AND ITS SALTS IN BOREHOLE SOIL SAMPLES

Phase III Environmental Site Assessment
Former Fire Training Area 1
London Airport
London, Ontario

	RESULTS[1]				
Sample Identification:	BH-116-1C	BH-116-1C DUP	BH-117-2A	BH-118-2A	WILLIAMS
Sample Date:	08-Jan-10	08-Jan-10	08-Jan-10	08-Jan-10	LAKE RISK
Sample Depth[2]:	0.8 to 1.4	0.8 to 1.4	1.5 to 2.3	1.5 to 2.3	BASED
Sample Description:	sand FILL	sand FILL	SAND	SAND	TARGET[1,3]
PARAMETER					
Perfluoro-1-Octanesulfonate	<25	<25	<25	<25	1300
Perfluoro-n-Octanoic Acid	<2.5	<2.5	<2.5	<2.5	-

NOTES:
1. All values shown as micrograms per kilogram (ug/kg) unless otherwise noted.
2. All depths are expressed as metres below ground surface (mbgs).
3. Value derived from 1999 site specific risk assessment as the most stringent target to protect ecological health. For guidance only.
4. "<" indicates concentration is below the laboratory detection limit.
5. Values in **bold** greater than the risk based soil target developed for the Williams Lake Airport.
6. BH-103-1C DUP and BH-116-1C DUP are duplicates of BH-103-1C and BH-116-1C, respectively. Samples with an unacceptable Relative Percent Difference (RPD) are double underlined.
7. Table to be read in conjunction with accompanying report.

Prepared by: LJJ
Checked by: BG/DM/SFL

TABLE IX

ANALYTICAL RESULTS FOR PERFLUROCTANESULFONIC ACID AND ITS SALTS IN GROUNDWATER SAMPLES

Phase III Environmental Site Assessment
Former Fire Training Area 1
London Airport
London, Ontario

	RESULTS[1]						
Sample Identification:	L1	MW1	L5	L6	L24	MDoH	WILLIAMS LAKE RISK
Sample Location:	Area 1	Dup L1	Area 1	Area 1	Area 1	HEALTH	BASED
Sampling Date:	20-Nov-09	20-Nov-09	20-Nov-09	20-Nov-09	20-Nov-09	GUIDELINES[1,2]	TARGET[1,3]
PARAMETER							
Perfluoro-1-Octanesulfonate (PFOS)	<5	<5	<5	<5	<5	0.3	0.4
Perfluoro-n-Octanoic Acid (PFOA)	<0.5	<0.5	<0.5	<0.5	<0.5	0.3	-

	RESULTS[1]					
Sample Identification:	L25	L26	MW-117	MW-118	MDoH	WILLIAMS LAKE RISK
Sample Location:	Area 1	Area 1	Area 1	Area 1	HEALTH	BASED
Sampling Date:	20-Nov-09	19-Nov-09	15-Jan-10	15-Jan-10	GUIDELINES[1,2]	TARGET[1,3]
PARAMETER						
Perfluoro-1-Octanesulfonate (PFOS)	<5	<5	0.228	0.120	0.3	0.4
Perfluoro-n-Octanoic Acid (PFOA)	<0.5	<0.5	0.0452	0.0887	0.3	-

NOTES:
1. All values shown as micrograms per litre (ug/L) unless otherwise noted.
2. Minnesota Department of Health guidelines for potable groundwater. For guidance only.
3. Value derived from 1999 site specific risk assessment as the most stringent target to protect human health. For guidance only.
4. "<" indicates concentration is below the laboratory detection limit.
5. Values in **bold** greater than the MDoH Guideline. Values in *italics* greater than the risk based soil target developed for the Williams Lake Airport.
6. Duplicate Analysis (MW1, MW2, MW-202), samples with an unacceptable RPD are double underlined.
7. Samples shaded were analyzed by AXYS and required dilution. Due to much lower values than other wells analyzed for PFOS and PFOA in Area 2, results are suspect.
8. Table to be read in conjunction with accompanying report.

ANALYTICAL RESULTS FOR PERFLUROCTANESULFONIC ACID AND ITS SALTS IN GROUNDWATER SAMPLES

Phase III Environmental Site Assessment
Former Fire Training Area 2
London Airport
London, Ontario

	RESULTS[1]					MDoH HEALTH GUIDELINES[1,2]	WILLIAMS LAKE RISK BASED TARGET[1,3]
Sample Identification:	L10	L11	L14	MW2	MW-101		
Sample Location:	Area 2	Area 2	Area 2	Dup L14	Area 2		
Sampling Date:	20-Nov-09	20-Nov-09	20-Nov-09	20-Nov-09	15-Jan-10		
PARAMETER							
Perfluoro-1-Octanesulfonate (PFOS)	***130***	***51***	***120***	***110***	***0.423***	0.3	0.4
Perfluoro-n-Octanoic Acid (PFOA)	***14***	***4.3***	***4.3***	***4.2***	***0.435***	0.3	-

	RESULTS[1]					MDoH HEALTH GUIDELINES[1,2]	WILLIAMS LAKE RISK BASED TARGET[1,3]
Sample Identification:	MW-202	MW-105	MW-106	MW-108	MW-109		
Sample Location:	Dup MW-101	Area 2	Area 2	Area 2	Area 2		
Sampling Date:	15-Jan-10	15-Jan-10	15-Jan-10	15-Jan-10	15-Jan-10		
PARAMETER							
Perfluoro-1-Octanesulfonate (PFOS)	***0.768***	***94***	<5	***49***	<5	0.3	0.4
Perfluoro-n-Octanoic Acid (PFOA)	***0.448***	***3.5***	<0.5	***3***	<0.5	0.3	-

	RESULTS[1]				MDoH HEALTH GUIDELINES[1,2]	WILLIAMS LAKE RISK BASED TARGET[1,3]
Sample Identification:	MW-110	MW-113	MW-114	MW-115		
Sample Location:	Area 2	Area 2	Area 2	Area 2		
Sampling Date:	15-Jan-10	15-Jan-10	15-Jan-10	15-Jan-10		
PARAMETER						
Perfluoro-1-Octanesulfonate (PFOS)	***0.400***	***26***	***0.466***	<5	0.3	0.4
Perfluoro-n-Octanoic Acid (PFOA)	***0.350***	***0.8***	***0.863***	<0.5	0.3	-

NOTES:
1. All values shown as micrograms per litre (ug/L) unless otherwise noted.
2. Minnesota Department of Health guidelines for potable groundwater. For guidance only.
3. Value derived from 1999 site specific risk assessment as the most stringent target to protect human health. For guidance only.
4. "<" indicates concentration is below the laboratory detection limit.
5. Values in **bold** greater than the MDoH Guideline. Values in *italics* greater than the risk based soil target developed for the Williams Lake Airport.
6. Duplicate Analysis (MW1, MW2, MW-202), samples with an unacceptable RPD are double underlined.
7. Samples shaded were analyzed by AXYS and required dilution. Due to much lower values than other wells analyzed for PFOS and PFOA in Area 2, results are suspect.
8. Table to be read in conjunction with accompanying report.

Prepared by: LJJ