Durham York Energy Centre Soils Testing Plan

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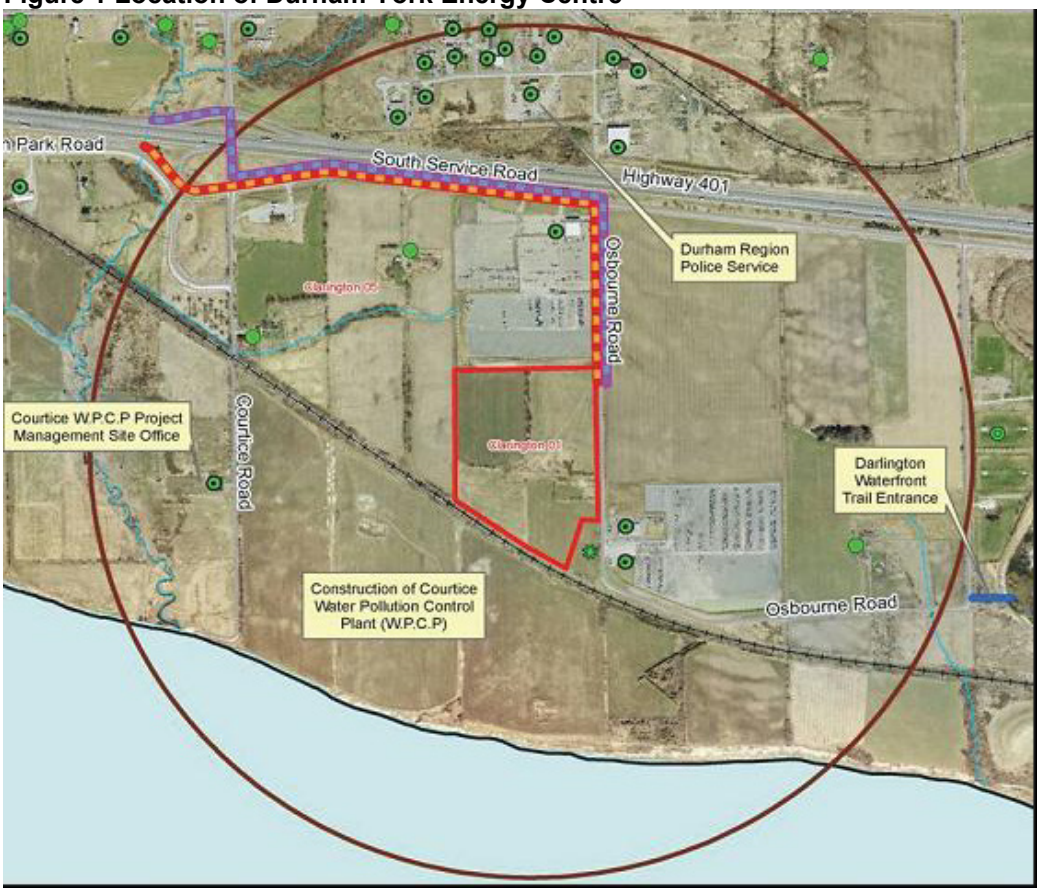
1. INTRODUCTION

1.1 Background

The Durham-York Energy Centre (DYEC) is a municipal solid waste to energy facility to be constructed in the Municipality of Clarington, Ontario. Owned by The Regional Municipality of Durham and The Regional Municipality of York (the "Regions"), the facility will process up to 140,000 tonnes of solid, non-hazardous, municipal solid waste per year. The facility will be designed, built, and operated by Covanta Energy Corporation (Covanta) under a 20 year contract with the Regions. The facility is to be located near the Courtice Road interchange of Highway 401, as shown below in Figure 1. The Regions received approval for the facility from the Ministry of the Environment (MOE) under the *Environmental Assessment Act* on November 3, 2010. Three applications for Certificates of Approval under the *Environmental Protection Act* (EPA) for waste; air and noise; and stormwater were approved as a multi-media Certificate of Approval by the MOE on June 28, 2011.

Figure 1 Location of Durham York Energy Centre



1.2 Objective

In accordance with Condition 7 (10a & 10b) and Condition 13 (4a & 4b) of the Energy from Waste (EFW) Certificate of Approval, the Regions have prepared this soil testing plan. This testing plan was also developed based on the Regional Council mandate to provide soil monitoring in the area of the DYEC for a three year period.

The purpose of the soil testing plan will be to:

a) Quantify background contaminant concentrations in the area

b) Monitor emission dispersion of EFW-related soil contaminants in nearby residential areas

c) Ensure ongoing environmental management of the site

d) Quantify any measurable concentrations resulting from emissions from the DYEC, including validating the predicted concentrations from the Human Health and Ecological Risk Assessment (HHERA) conducted during the 2009 Residual Waste Environmental Assessment (EA) Study, for predicted soil contaminant loading over the life of the facility

1.3 Pre-construction Conditions

During the baseline study undertaken in the Environmental Assessment, 23 soil samples were collected at 17 sampling locations from areas surrounding the site. Samples were analyzed for metals, volatile organic compounds (VOC's), ammonia, formaldehyde, acetaldehyde, semi-volatile organic compounds (SVOC's), polycyclic aromatic compounds (PAH's), polychlorinated bi-phenols (PCB's) and dioxins and furans (PCDD/PCDF) and chlorophenols.

Results of the analysis showed that there were no soil metal contaminants of potential concern concentrations above the Table 1 of the Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act (Table 1 Standards). SVOC's were not detected in any of the samples. There were no soil chlorophenol concentrations above the Table 1 Standards. PCB's were not detected in any of the samples analyzed. PCDD/PCDF cogeners were detected in 1 of the 13 samples analyzed. The location in which PCDD/PCDF were detected was from a sample taken from a field where previous intensive agriculture activities occurred. The detection of PCDD/PCDF is likely attributed to the earlier application of pesticides. The result was still below the contaminated site standard in Ontario for agricultural land use. In all other samples, no

PCDD/PCDF cogeners were detected above the Table 1 Standards. There were no PAH concentrations above the Table 1 Standards. VOC's were below the detection limit in each of the samples, however, some of the analytical detection limits were greater than the Table 1 Standards. Formaldehyde and acetaldehyde were detected in all samples, however, there is no data in the Table 1 Standards for these parameters.

1.4 Potential Sources of Impacts

Soil was one of the most important of the media considered in the HHERA (Human Health and Ecological Risk Assessment) due to emissions outfall from the facility, the exposure pathway for human and ecological receptors and the natural environment, as well as the potential for chemical bioaccumulation over the life of the facility. The primary source of deposition to soil are the facility emissions. The main source of emissions is the 87.6 metre tall main stack.

Local human populations, visitors and ecological inhabitants to the area surrounding the facility may be directly exposed to soil. This testing program will provide an early warning if potential bioaccumulative effects were to occur.

The HHERA assessed all chemicals based on the single highest annual soil concentrations throughout the operating lifetime of the Facility. This typically occurs at the end of the operating period (i.e. 30 years of accumulation) at which point the concentration is assumed to have reached steady-state in the environment (and not degrade) over the next 70 years of a lifetime of human exposure.

The HHERA evaluated a broad range of chemical species identified as contaminants of potential concern (COPC) under normal operation and process upset scenarios. The HHERA concluded that after 30 years of operation soil concentrations would increase less than 2% over baseline concentrations for all COPC except dioxins/furans and inorganic mercury. Soil concentrations of dioxins and furans were estimated to increase by 20% and 57% for the normal operation and process upset scenarios respectively. Inorganic mercury concentrations were estimated to increase by 4.6% and 6.7%.

2. SOILS TESTING LOCATIONS

2.1 EFW Site Description

The DYEC will be located on undeveloped land owned by Durham, located south of Highway 401, in the Municipality of Clarington (the "Facility"). The Facility is

located at 72 Osborne Road, north of a Canadian National rail corridor. There are commercial properties north of the Facility. The lands east and west of the facility are undeveloped commercial land, which are currently used for agricultural purposes. The Courtice Water Pollution Control Plant is south and the Darlington Nuclear Generating Station is located approximately 1.8 kilometers (km) to the east of the Facility. The nearest major intersection is Highway 401 and Courtice Road, which is approximately 1.7 km from the Facility. The location of the DYEC relative to the local area is shown in Figure 1 above. The DYEC will be located about 750 metres (m) north of Lake Ontario. Lake Ontario is at an elevation of approximately 70 m above mean sea level and along the shoreline there is an escarpment which is approximately 20 m above the lake's water level. North of the lakeshore, the local topography is relatively flat with terrain elevations varying from 90 m to 100 m above mean sea level within the immediate vicinity of the Facility. The soil baseline study undertaken by Jacques Whitford during the Environmental Assessment (EA) study found that surface soils at the DYEC and in the surrounding area belong to the Darlington loam soil series having fair to good drainage and belonging to the hydrologic soil group 'C', with a typical curve number (CN) of 74. Underlying subsoil was characterized as Newmarket Till, a dense till comprised of clayey silt and sand.

2.2 Soil Testing Site Descriptions

The soil monitoring plan locations are linked to the ambient air monitoring locations as per section 13 (4) (a) of the Certificate of Approval. As such, three testing locations have been identified and approved by the MOE. An upwind site was selected at the Courtice Water Pollution Control Plant, approximately 1 km from the EFW site. This site optimizes siting criteria requirements and will act as a background monitoring station. This area is outside of the area of modeled maximum emissions outfall, is owned by the Region and will have very little potential for soil plot disturbance. A downwind site was selected on private property near Baseline and Rundle Road in Clarington, approximately 2.5 km from the EFW site. A property lease has been negotiated with the owner. This site is within the area of modeled maximum predicted emission outfall and is an ideal site for quantifying contaminant concentrations which may result from the DYEC facility emissions. A third station, located inside the property line of the DYEC, will monitor the low level fugitive emissions from the facility only as it is not representative of a background station nor is it within the area of maximum emissions outfall.

3. SOILS TESTING PLAN

3.1 Establishment of Sampling Locations

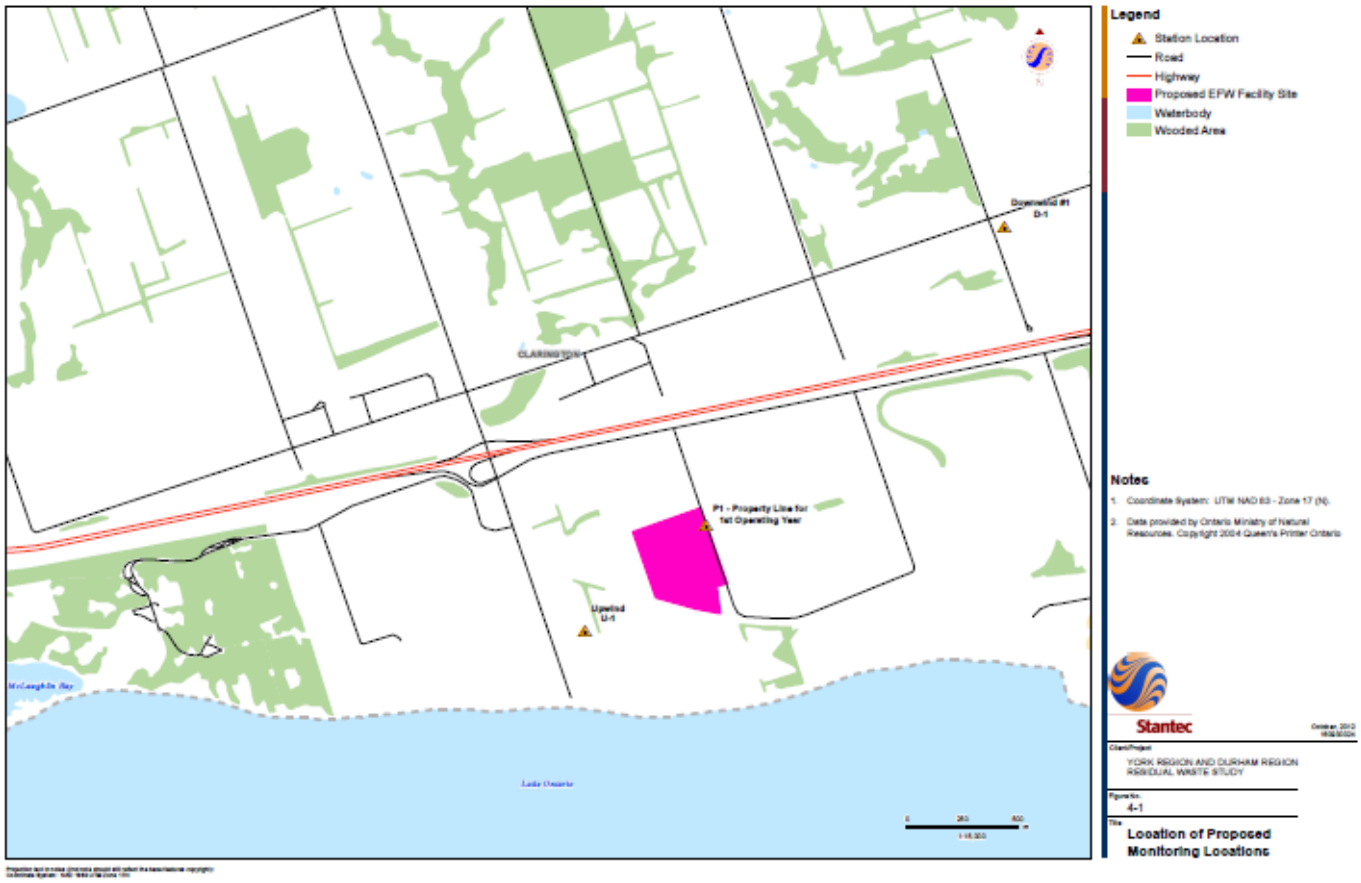
In accordance with Certificate of Approval Condition 13 (4) (a), sampling locations will be situated in the same location as the ambient air monitoring stations. One soil and ambient air sampling will occur within the location of maximum predicted ground level concentration according to the dispersion modelling undertaken for the EA. A second station will act as a background monitoring station for comparison. A third station is located at the property line. The proposed locations for ambient air monitoring are based on the results of the air quality assessments, prevailing wind direction, locations of nearby residences, and the requirements outlined in the Ambient Air Monitoring Plan. In addition, dispersion model predictions are an aide in the siting of ambient air monitoring stations recommended by the United States Environmental Protection Agency (40 CFR, Part 58) (US EPA). A dispersion modeling study of emissions from the DYEC was completed as part of the approved EA for this project (Jacques Whitford, 2009). This study examined emissions of about 90 different contaminants of potential concern including criteria air contaminants, metals, PAHs, and dioxins/furans. The maximum off-property ground-level concentrations due to emissions from the DYEC were estimated using the CALPUFF dispersion model. The predicted maximum annual average concentration occurs approximately 1.5 km to the northeast of the DYEC, with another area of almost as high annual concentrations occurring about 1.5 km to the west-northwest of the DYEC.

The DYEC Ambient Air Quality Monitoring Plan outlines the requirement for three monitoring stations, one station situated upwind, one downwind and one inside the property line of the DYEC. The DYEC Ambient Air and Soil Monitoring locations are shown below in Figure 2.

Soil testing will be undertaken in the locations where an ambient air monitoring station is operating and approved by the MOE as part of the Ambient Air Monitoring Program.

Soil testing reports will be reviewed and assessed with the MOE as required by Certificate of Approval Condition 15 (4).

Figure 2 Proposed Ambient Air Monitoring Stations and Soil Testing Locations



3.2 Testing Period

The testing program will commence 120 days following the Certificate of Approval to monitor baseline soil quality in the absence of emissions from the DYEC (as per Certificate of Approval Condition 7 (10a)). In accordance with the Region of Durham Committee of the Whole Report, 2009-COW-01, soil testing shall be carried out to supplement stack testing for a three year period once the facility is operational after which time its effectiveness will be evaluated with the Medical Officer of Health (MOH) and the MOE. Soil testing shall be undertaken once every three years within the same season each year or until notification is received from the MOE Regional Director advising that the monitoring is no longer required. The testing period is as follows:

2012 – sampling to establish baseline

2014 – sampling to supplement stack testing (operation yr 1)

2015 – sampling to supplement stack testing (operation yr 2)

2016 – sampling to supplement stack testing (operation yr 3)

2017 – sampling program to be evaluated by MOH and MOE

2019 – sampling to supplement stack testing (every three years)

3.3 Surface Soils Field Sampling Procedure

Surface soil samples will be composite samples which are created in the field at the sampling location within a sampling grid.

Site field observations will be recorded during each sampling event. Geographical Positioning Systems (GPS) co-ordinates for each plot will be recorded and the plot locations will be marked with stakes to assist with the plot identification in future sampling events.

For each of the testing locations, a composite sample, comprised of a minimum of nine areas within an approximate 10 m by 10 m grid pattern, will be collected to a depth of 0-2 cm for the analysis of surface soil. Separate composite samples will be collected for inorganic analysis, dioxin and furan analysis and organics analysis. A sufficient quantity of sample must be collected to ensure proper analysis and quality control can be carried out at the laboratory. The laboratory should be contacted to ensure adequate quantity is collected.

3.4 Surface Soils Sample Retention

One sample from the initial sampling event will be retained for duplicate soil sample retention in accordance with the following:

a) Quantity of Sample to be stored: A sufficient quantity shall be retained from the initial background sampling event to allow for at least one reanalysis for all the parameters that are being tested as per the plan.
b) Containers for storage: Amber glass sample jars (typically about 180 to 225 ml)
c) Method of storage: Cool dark and dry cupboard.

3.5 Sample Handling

Procedures that avoid cross-contamination of samples and degradation and loss of substances shall be used when soil is:
(a) collected,
(b) handled,
(c) stored,
(d) transported, and
(e) analyzed.

Before any surface soil work begins, all equipment will be decontaminated in order to prevent cross contamination between sampling locations. Each piece of sampling equipment that comes into contact with soil during sampling will be decontaminated before work at each sample location. Decontamination should include removing excess soil from equipment, washing with detergent to remove dirt, oils and grease, and rinsing with de-ionized water to remove the detergent. For organic sampling the equipment should further be rinsed with acetone and hexane to eliminate the potential for cross contamination.

Sample handling, container requirements for parameter analysis, storage and preservations requirements must be carried out in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties Under Part XV.1 of the Environmental Protection Act.

3.6 Field Documentation

Documentation of observations and data acquired in the field will provide information on the proper acquisition of samples and also provide a permanent record of field activities. These observations and data will be recorded in the field notebook or on the sample collection data sheets. In addition, each surface soil sampling location will be photographed and a qualified consultant will produce a map identifying the grid pattern used and the plot location layout.

Field documentation should include the following:

- site name and photograph
- GPS coordinates for sample plot locations
- field personnel's name
- date, time and location of sample collection
- sample number/ID
- whether QA/QC samples were collected
- type of containers used for collection
- whether samples were preserved, and type and quantity of preservative
- sampling method and composite collection pattern/map of test plot area
- unusual site conditions
- weather conditions

A summary of field data will be included with the Soil Testing Reports.

3.7 Sample Transportation and Labeling

d) All sample containers must be well sealed and placed into a cooler with ice cubes (or ice packs) and protective packing materials if required.

e) Sample identification, labeling, documentation, and quality control will be implemented.

f) Laboratory submission and/or chain of custody forms are to be appropriately completed and signed, and soil samples are to be submitted to the laboratory within 24 hours of sampling.

4. LABORATORY ANALYSIS

4.1 Laboratory Analysis Requirement

All samples will must be submitted to a laboratory that is accredited by an internationally recognized accreditation body, such as the Canadian Association for Laboratory Accreditation (CALA) or the Standards Council of Canada (SCC) in accordance in accordance with the International Standard ISO/IEC17025:2005 – General requirements for the Competence of Testing and Calibration Laboratories.

Samples will be analyzed in accordance with Standard Methods for Soil and Sediment and/or the Protocol for Analytical Methods Used in the Assessment of Properties Under Part XV.1 of the Environmental Protection Act.

4.2 Analytical Parameters

A comprehensive list of analytical parameters were analyzed in the soil baseline sampling testing conducted by Jacques Whitford in 2009 for the HHERA which was completed for the EA. Based on those results, the predicted emissions, and Certificate of Approval Condition 13 (b) (ii), the parameters which will be tested will include Metals, Polycyclic Aromatic Hydrocarbons (PAH), and Dioxins and Furans (PCDD/PCDF).

Table 1: Analytical Parameters for Soil Analysis

Metals	
	Antimony
	Arsenic
	Barium
	Beryllium
	Boron
	Cadmium
	Chromium (total)
	Chromium V1
	Cobalt
	Copper
	Lead
	Mercury
	Methyl Mercury
	Molybdenum
	Nickel
	Phosphorus
	Selenium
	Silver
	Thallium
	Tin
	Vanadium
	Zinc
Polycyclic Aromatic Hydrocarbons (PAH's)	
	Anthracene
	Benzo(a)fluorene
	Beno(a)pyrene TEQ
	Benzo(b)fluorene
	Fluorene
Dioxins and Furans (PCDD/PCDF)	
	Total PCDD/PCDF (TEQ)

4.3 Analytical Parameters Not Analyzed

VOC's were not chosen to be analyzed in soil, as ambient air emissions of these contaminants are expected to occur in trace amounts and predicted ambient concentrations of speciated VOCs are all well below method detection limits.

Ammonia was also not included for analysis in soil as the maximum predicted ambient air NH3 concentration is less than the method detection limit.

5. QUALITY ASSURANCE/QUALITY CONTROL

Some or all of the following quality control measures will be performed during sample analysis for Quality Assurance/Quality Control purposes (QA/QC) in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties Under Part XV.1 of the Environmental Protection Act.

a) lab duplicate sample
b) certified reference material (where applicable)
c) field/travel blanks (where applicable)
d) method blanks
e) laboratory control sample/blank spike analyses
f) matrix spike analysis (where applicable)
g) surrogate recoveries (where applicable)
h) internal standards
i) calibration verifications

Certificates of Analysis must be provided by the testing laboratory.

6. REGULATORY CRITERIA

The soil samples will be evaluated against Table 1 of the Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act (Table 1 Standards), the baseline sampling results (collected and analyzed to evaluate baseline or facility pre-operational soil conditions in 2013), and the background (upwind) monitoring and property line stations.

The Table 1 Standards are considered representative of upper limits of typical province-wide background concentrations in soils that are not contaminated by point sources and are the most conservative standards for which to evaluate data against.

Separate standards are provided for industrial, agricultural, and residential zones. The industrial zone standards will be used for the current monitoring locations. Any future adjustments to the monitoring locations may require the use of the agricultural or residential standard, as appropriate.

7. CONTINGENCY PLAN

Where a sample collected and analysed during Facility operation exceeds a parameter value from the baseline or Facility pre-operational sampling event, and if the value exceeds a parameter in the Table 1 Standards, this sample area shall

be re-sampled and analysed and noted in the testing report. If the resample parameter value is still in exceedance, the MOE shall be notified and the Regions will submit written recommendations regarding any corrective action that may be required within 90 days of the re-sampling event.

8. REPORTING

8.1 Soil Test Reporting

Within one month of completion of each soil testing event, the Regions will submit a soil testing report to the District Manager in accordance with Certificate of Approval Condition 15 (4). A letter dated January 28, 2014 from the MOE District Manager affirms the MOE considers the "soil testing event" to include completion of soil sample laboratory analysis.

Soil Testing Reports shall be kept on-site at all times and be available for inspection by a Provincial Officer upon request. In addition, this testing plan and subsequent reports will be presented to the Energy from Waste Advisory Committee (EFWAC).

8.2 Posting to the Website

The Soil Testing Plan and the subsequent Soil Testing Reports shall be posted to the DYEC website.

9. REFERENCES

Soil, Groundwater and Sediment Standards for use under Part XV.1 of the Environmental Protection Act, April 15, 2011

Ontario Reg. 153/04 Records of Site Condition - Part XV.1 of the EPA,

Ontario Reg. 179/11 EPA Amending Ontario. Reg. 153/04

Protocol for Analytical Methods Used in the Assessment of Properties Under Part XV.1 of the Environmental Protection Act, Ministry of Environment Laboratory Services Branch, Amended July 1, 2011

DYEC Ambient Air Monitoring Plan (Stantec, 2012)

Human Health and Ecological Risk Assessment Technical Study Report (Jacques Whitford, 2009)

Natural Environment Technical Study Report (Jacques Whitford, July 31, 2009)

Geotechnical Investigation Technical Study Report (Jacques Whitford, July 31, 2009)

Canadian Council of Ministers of the Environment, A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines, 2006

EA Baseline Sampling Program (Jacques Whitford, 2008)

10. List of Figures

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