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April 1, 2015 Reference No. 084692

Anthony Ciccone, Ph.D., P.Eng.
Golder Associates Ltd.
141 Adelaide Street West, Suite 910
Toronto, Ontario
M5H 3L5

Dear Dr. Ciccone:

Re: Response to memorandum from Golder Associates Ltd., commissioned by Hamilton's Medical Officer of Health and Hamilton Public Health Services, on the Air Quality Assessment Report
Port Fuels and Materials Services, Inc.
Environmental Screening

Port Fuels and Materials Services, Inc (PFMSI) and Conestoga-Rovers & Associates (CRA) have reviewed the memorandum received via email on March 19, 2015 from Garrod Pickfield LLP providing comments from Golder Associates Ltd. (Golder), on behalf of Hamilton's Medical Officer of Health and Hamilton Public Health Services, on the Air Quality Assessment Report prepared and appended to the Environment Screening Report (ESR), completed as part of the Environmental Screening Process. The attached table responds to both the General Comments as well as the Specific Comments and Concerns identified in the memorandum.

We believe that the responses provided fully address Golder's comments on the Air Quality Assessment Report. Should you have any additional questions, please do not hesitate to contact myself or Mr. Bob Clark of PFMSI.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Gordon Reusing, P. Eng.

GR/cb/1

Issues and Concerns	Proponent Response
General Comments The effects of the releases to the atmosphere from the Project are addressed in Appendix F of the ESR and include estimates of air concentrations and deposition of compounds released from the Project. The Air Quality Assessment Report (AQAR) addresses the change to airborne concentrations while the deposition data, along with the concentration data, are used in the Human Health Risk Assessment (HHRA). The AQAR summaries existing air quality based on ambient air monitoring data provided by the Hamilton Air Monitoring Network (HAMN) and future concentrations of the Project from dispersion modelling based on the Emission Summary and Dispersion Modelling (ESDM) report of the Project as prepared by CRA. An ESDM report is used to support Environmental Compliance Approval (ECA) applications and is the minimal requirement for the application. The MOECC have provided guidelines to follow when applying for an ECA as can be found in MOECC document Air Dispersion Modelling Guideline for Ontario. As this is not an application for an ECA the exclusion of various sources such as truck traffic, on-site vehicles (indoor and outdoor), comfort heating, etc. is not common practice for an environmental assessment. The selection of the AERMOD model to calculate airborne concentrations and deposition flux of the ground is acceptable. AERMOD was executed assuming that all the facility wide emissions were released from the Engine stack during Normal Conditions or from the Bypass Thermal Oxidizer stack during bypass situations. This needs to be collaborated by reviewing the AERMOD input files but this is an unrealistic model parameterization of the Project.	CRA agrees that the selection of the AERMOD model is acceptable. Each source of emissions from the Facility were modelled using their individual stack parameters. Contaminants emitted from more than one source were modelled utilizing the source specific emission rate for each respective source. Dispersion factors were used in the case of contaminants that are emitted only from the syngas combustion process. Syngas combustion emissions from Source A8 (Engines) and A7 (Bypass Oxidizer) used dispersion factors where appropriate.
General Comments In addition, no sensitivity analysis was provided in situations where less than seven engines were in operation. These could lead to higher airborne concentrations even though the emissions have decreased. Further, start-up and shutdown scenarios were not evaluated or explained thoroughly.	CRA can confirm that the reduced momentum and buoyancy dispersion that results from less than 7 engines operating is offset by the mass reduction of air contaminant mass emissions, with the net result being a decrease in off-site contaminant concentrations. Therefore the 7 engines operating scenario represents the worst case for the HHRA. A discussion of the potential emissions during startup, shutdown and operation of less than 7 engines will be added to the Air Study.

General Comments The emissions for the Project Gasplasma system are based on source testing of a pilot scale facility in the UK. The composition of the pilot plant feedstock is not provided nor is the composition of the resulting syngas. The engine sizes of neither the pilot plant nor the Project engines are provided but given the exhaust volume from the Project engine, these are significantly larger than the Pilot plant. These are likely internal combustion gas engines and the emissions do not scale linearly based on experience with other systems. Further information is required to confirm the scalability of the engines.	PFMSI has developed a fuel specification that details the requirements for the quality of the waste fed into the fluidized bed gasifier (FBG). The source tests for the Swindon facility were conducted while the pilot-scale unit was processing a similar fuel specification. The different waste streams will be blended in the reception hall to create a homogenized feedstock which will be sent to the material recovery facility (MRF) and subsequent RDF storage areas. Operators will be responsible to test the RDF and ensure that it consistently complies with the required specification. In the event that some parameters of the prepared RDF falls outside the ranges defined for the gasifier feed, the many downstream process steps of gasification, plasma cracking/reforming, and syngas cleaning, ensures that the syngas quality remains consistent and suitable for electricity production. The gas engine in the Swindon plant has been converted from a dual fuel engine to run on syngas and has a relatively coarse engine management system. This engine operates on a fixed air/ fuel ratio control, which limits the ability of the engine to adjust the mix of fuel and air entering the cylinder as the fuel varies. This means the engine is operated sub-optimally and at a relatively low temperature making the Swindon engine significantly less efficient than the proposed full-scale, state of-the-art PFMSI engines. The gas engines proposed for the PFMSI Facility have a sophisticated engine management system, which includes automated fuel air ratio control whereby these are managed to give an optimum temperature within each cylinder. Additionally the engines for Hamilton will be fitted with an SCR and oxidation catalyst. Therefore, the use of the Swindon emissions data is considered a very conservative approach when applied to the full scale engine flows.
General Comments The Project has been designed to accept biomass, biosolids or liquid waste but no information is provided on the storage and handling of these feedstocks.	Details of the storage capacity for the Gasplasma® System and the Direct Plasma System are provided in Sections 4.6.1 and 4.6.2 of the Design and Operations Report (D&O Report), respectively. Handling of the incoming feedstock is discussed in detail in Section 5.2 of the D&O Report.
General Comments Emissions from the Bypass Thermal Oxidizer are assumed to be similar to the pilot plant test results although the combustion technologies are different. There is inconsistency between the text, emission tables provided and description provided by the technology provider.	For the reasons noted above comparing the Swindon engine to a full-scale PFMSI engine, the Swindon data is a conservative approach to estimating the potential emissions from the by-pass thermal oxidizer. A thermal oxidizer will have even better combustion efficiency than an engine, with longer residence time and higher combustion temperature than an engine.

General Comments There are a number of errors and inconsistencies in the reports and appendices including meeting the Ontario A7. The in-stack concentrations provide for the Project are referenced to Normal conditions (aka. 0C, 101.3 kPa, dry & 11% O2) while Ontario A7 guideline use (25C, 101.3 kPA, dry & 11% O2). Further, the Total Organic Compounds (TOC) and CO in-stack concentration at the engines is reported to be 27.2 and 1460 mg/m^3 in the appendices after controls which are two orders of magnitude different from the AQAR report and the CO is well above the A7 guideline of 40 mg/ m^3.	Please see the responses to the Specific Comments. We have addressed all comments and can confirm that the outcome is that there are no changes to the HHRA results and conclusions. As stated in the Environmental Screening Report, Section 8.2, PFMSI is committed to achieving the levels set forth in Ontario Guideline A-7, including the guideline level for in stack CO concentrations which have been set to ensure optimum combustion conditions are achieved. Also per the Environmental Screening Report, Section 8.2, CO concentrations will be monitored by a continuous emissions monitoring (CEM) system to ensure ongoing compliance in accordance with Approvals obtained by the Facility.
General Comments The net effect on carbon dioxide was not proven and is questionable given the quantity of natural gas consumed by the Bypass Thermal Oxidizer.	The thermal oxidizer consumes approximately 1.5 MMBTU/hr of natural gas while on hot standby. The rated capacity presented in Table A.5a of the ESDM incorrectly identifies the capacity as 29 MMBTU/hr which is not applicable during hot standby. Table A.5a will be revised to show the hot standby gas consumption. Please also see response to Specific Comment # 26.
Specific Comments **A. Baseline/Existing Conditions** 1. Appendix A presents the Ambient Air Monitoring Data from the Hamilton Air Monitoring Network (HAMN). Four of the HAMN stations were used to establish baseline conditions primarily because they were located in residential areas of interest. It is unclear why only three years (2011-2013) were used to establish baseline. In addition, US Steel has reduced productivity in 2011 and the results of background levels may be lower due to the reduction in activity.	The data available from the HAMN network was reviewed and assessed. It was determined that the most recent three years of data available (2011 to 2013) is the most representative sample of the current baseline conditions within the vicinity of the proposed PFMSI facility. There have been significant reductions in emissions from the steel mills in particular in recent years, therefore going back three years is a reasonable time period to assess current conditions. We agree that the decrease in production at US Steel will have an effect on the baseline ambient air conditions, and this supports our use of post 2011 ambient air data rather than pre-2011 ambient air data and most representative of existing ambient air concentrations. CRA has also reviewed the 2009 and 2010 HAMN data and determined that addition of this data would not change the results or conclusions of the HHRA.
2. The report refers to two MOECC ambient air monitoring stations in Downtown (Stn 29000) and Hamilton Mountain (29114) as reporting NOx, SO2, PM2.5 and CO. These stations are collocated with Environment Canada NAPS stations 060512 (Downtown) and 060513 (Hamilton Mountain) which report additional metals and VOC data.	The data for NAPS stations 060512 (Downtown Hamilton) and 060513 (Hamilton Mountain) was reviewed. It was identified that station 060512 has 16 VOC and metals compounds background concentrations that we have now incorporated into the Air and HHRA studies. There were no significant changes to the HHRA results or conclusions after addition of this data. A review of station 060513 indicated that the Hamilton Mountain station does not have additional data that can be incorporated into the Air or HHRA studies.

3. Data from NPRI for the region of interest are not discussed or present. It is important to compare projected emissions from the Project with existing emissions to understand the potential change in atmospheric loadings. In addition, the NPRI data shows compounds which are not captured through ambient air monitoring.	Agreed, the estimated PFMSI emissions can be compared to National Pollutant Release Inventory data for Canada, Ontario and the Hamilton area in particular. It can be shown that the PFMSI facility has very small emissions relative to the steel mills and other heavy industry in the Hamilton area.
4. The background or baseline levels as presented in Appendix A do not match with the background levels presented in Table 3 -6 of the AQRA.	Tables 3 through 6 of the AQAR do not present background concentrations. Tables 3 to 6 of the AQAR present a summary of the calculated risk and hazard levels for baseline, normal and bypass operating conditions of the Facility as completed within the Human Health Risk Assessment. Therefore, a comparison of the background levels presented in Appendix A cannot be completed with the data presented in Tables 3 to 6.
5. Greenhouse gas emissions from the Project can be compared to the Ontario inventory for context.	The PFMSI facility GHG emissions can be compared to the Ontario inventory, and will be relatively small compared to other major sources, particularly those in the Hamilton area such as the steel mills and other heavy industries. More importantly, the Facility will result in a net reduction in GHG emissions and have a positive impact on reducing global warming. Please see response to Comment 26.
B. Project Description (Section 4.0) 6. The Project will receive and process 170,000 tonne/yr of Gasplasma waste over 282 business days. The Project subsequently states the average per regular business day is 605 tonne/day. Over 282 days, this amounts to 170,610 tonne/yr. Similarly for the Direct Plasma which consumes 110 tonne/day, results in 31,020 tonne/yr as compare to the stated capacity of 30,000 tonne/yr. ***(The City of Hamilton – Health Department)***	As stated in Section 4.3.1 and 4.3.2 of the Design and Operations Report, the annual maximum quantity will be the limiting factor for the processing of waste at the Facility, rather than the daily maximum.
7. The Project identifies maximum and average consumption/receiving quantifies but it is not clear what quantity of waste is used to generate syngas at maximum capacity.	The maximum continuous waste material loading rate is provided in Section 4.4 of the Design and Operations Report. This is the feed rate into the gasifier after material receipt and fuel preparation has occurred.

8. The report states that 20 MWe will be generated from seven (7) gas engines and a steam turbine. The size of the engines and combustion gas usage is not provided. It is unknown how these engines differ from the pilot test engines used to develop the emission releases.	The gas engine in the Swindon plant has been converted from a dual fuel engine to run on syngas and has a relatively coarse engine management system. This engine operates on a fixed air/ fuel ratio control, which limits the ability of the engine to adjust the mix of fuel and air entering the cylinder as the fuel varies. This means the engine is operated sub-optimally and at a relatively low temperature making the Swindon engine significantly less efficient than the proposed full-scale, state of-the-art PFMSI engines. The gas engines proposed for the PFMSI Facility have a sophisticated engine management system, which includes automated fuel air ratio control whereby these are managed to give an optimum temperature within each cylinder. Additionally the engines for Hamilton will be fitted with an SCR and oxidation catalyst. Therefore, the use of the Swindon emissions data is considered a very conservative approach when applied to the full scale engine flows.

<table>
<tr>
<td>9. The composition of feedstock of the Project versus the pilot plant is not discussed and this would seem to be an important aspect to scale up the Project.</td>
<td>
PFMSI has developed a fuel specification that details the requirements for the quality of the waste fed into the fluidized bed gasifier (FBG). The source tests for the Swindon facility were conducted while the pilot-scale unit was processing a similar fuel specification, as indicated in the table below.

<table>
<tr><th>Component</th><th>Unit</th><th>PFMSI RDF Specification</th><th>RDF used at Swindon pilot plant</th></tr>
<tr><td>Carbon</td><td>wt%</td><td>33 - 42</td><td>41.76</td></tr>
<tr><td>Hydrogen</td><td>wt%</td><td>5.0 - 5.8</td><td>5.05</td></tr>
<tr><td>Sulphur</td><td>wt%</td><td><= 0.17</td><td>0.13</td></tr>
<tr><td>Nitrogen</td><td>wt%</td><td><= 1.1</td><td>3.02</td></tr>
<tr><td>Oxygen</td><td>wt%</td><td>25 - 30</td><td>23.39</td></tr>
<tr><td>Chlorine</td><td>wt%</td><td><= 1.0</td><td>0.25</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Ash</td><td>wt%</td><td>10 - 20</td><td>11.8</td></tr>
<tr><td>Moisture</td><td>wt%</td><td><= 30</td><td>14.6</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Net Calorific Value (NCV)</td><td>MJ/kg</td><td>13 - 17</td><td>19.89</td></tr>
<tr><td>Density</td><td>kg/m^3</td><td>100 - 200</td><td>n/a</td></tr>
</table>

The different waste streams will be blended in the reception hall to create a homogenized feedstock which will be sent to the material recovery facility (MRF) and subsequent RDF storage areas. Operators will be responsible to test the RDF and ensure that it consistently complies with the required specification.

In the event that some parameters of the prepared RDF falls outside the ranges defined for the gasifier feed, the many downstream process steps of gasification, plasma cracking/reforming, and syngas cleaning, ensures that the syngas quality remains consistent and suitable for electricity production.
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10. Start-up and shut-down conditions are not examined in the operating scenarios. Information on the time required to start the engines or whether they all start in unison or sequentially should be addressed. Under the normal operating scenario, the Project assumes that no syngas is consumed at the By-pass Oxidizer.	Detailed descriptions of the procedures for cold start-up and shutdown of the Facility are provided in Sections 7.1 and 7.2 of the D&O Report, respectively. The engines will be started up sequentially and each engine will take approximately 20 minutes to ramp up to capacity. Start up, in combustion mode, uses approximately 10% of the waste fuel that is used in gasification. Consequently there will be significantly lower mass emission rates during start up. One of the scenarios that was modeled and assessed in the HHRA was a bypass of all syngas to the thermal oxidizer in the event of a malfunction or upset with the engines that would normal use the syngas as a fuel. This is the only realistic upset scenario and has been modeled in the worst case with the maximum production of syngas going to the oxidizer. The oxidizer is on continuous standby so that any in the event of any upset or malfunction; the syngas will immediately be directed to the oxidizer. This information will be added to the Air Study.
11. Quantity of off-spec syngas consumed by the Bypass Oxidizer is not provided. As found in Appendix E App Document: 166-MB-140523-ASP4 – Emission Data, the Bypass Oxidizer has three modes of operation, namely Standby, Processing combustion gas during start-up and shut-down and Processing syngas are described. The impact of start-up and shut-down should be addressed.	Please see response to comment 10.
12. The ESDM report notes that the Auxiliary Steam Boiler will be used during start-up after annual maintenance.	This is correct. The purpose of the natural-gas fired auxiliary boiler will be to provide steam during start-up in order to produce sufficient dry-RDF while the thermal process is not operating, and for balancing the steam load during start-up of the gasification system as required. The use of this boiler is therefore expected to be limited to during start-up and the period immediately after annual maintenance shutdown.

13. There is no information provided on start-up or shut-down of the Direct Plasma system.	The startup and shut down processes of the direct plasma furnace are common to most plasma furnace applications. When starting the plasma furnace from cold with a new refractory lining, the startup procedure consists of gradually preheating the furnace over a period of a typically 3 to 5 days using a natural gas-air burner. Starting the furnace from cold with a used lining requires around half the preheating time and starting from a hot furnace is even shorter still, depending on the temperature at the beginning of the startup period. The furnace hearth is covered by pieces of metal and slag and once the gas burner preheat cycle is completed, the plasma arc is initiated in the furnace and the plasma is used to bring the furnace up to full working temperature over the course of several hours. The plasma furnace is shut down by first stopping the feed into the furnace. The plasma system is allowed to operate as normal for a ‘soaking’ period of typically 30 minutes to 2 hours in order to allow the feed material to react completely and all reactions in the furnace to cease. This process is monitored by observing readings from the off gas abatement system, such as thermal oxidizer temperatures, gas compositions, etc. and determining the typical ‘soaking’ time forms a key part of the commissioning process. Once all reactions have essentially ceased, the contents of the furnace are usually removed by tapping the furnace, the tap hole is sealed and the plasma arc is extinguished. The off gas system then goes through a controlled shut down procedure that is controlled automatically by the computer control system until the whole system reaches a safe condition. The above information will be added to the Air Study.
14. There is a lack of information on on-site mobile sources such as front-end loaders, forklifts, truck traffic or queueing. These have been ignored in the assessment claiming them to be insignificant sources. More detailed justification is required.	CRA has added mobile sources to the emissions modelling and HHRA. We can confirm that the results and conclusions of the HHRA are not affected by the addition of the mobile sources emissions. The primary on-site mobile sources are delivery and waste trucks. As indicated in the Design and Operations Report, there will be an average of 24 large vehicles (36 tonne/load) and 24 small vehicles (9 tonnes/load) per day delivering waste to the Gasplasma® process. It is also indicated that there will be an additional 24 large vehicles and 13 small vehicles for Transfer and Direct Plasma waste deliveries. Emissions were estimated for emissions from the vehicles using Mobile 6.2C software and assuming the worst case on-site truck route for the Gasplasma delivery vehicles and the transfer and Direct Plasma vehicles. The primary contaminants of concern from vehicle exhaust are NOx, CO, PM2.5 and SO2. These emissions represent less than1% of the total emissions of these compounds from the Facility.

15. There is no information provided on how feedstock from rail and barge will be conveyed to the Waste Recreation Building	Details of the material receipt procedures at the Facility are provided in Section 5.2.1 of the Design and Operations Report. The waste from barge will be unloaded at an appropriate off-site dock, loaded onto a truck and delivered to the site. There will be a railcar receiving station on-site. The material will be transferred from rail in enclosed vehicles to the tip floor.
16. There is no information on how biosolids and biomass will be received, stored or handled. The emission profiles do not seem to be reflective of this type of feedstock.	As described in the Design and Operations Report, solid biomass will be delivered into the reception hall and biosolids/ sludge will be delivered into the enclosure adjacent to the wet RDF storage area. Both of these areas will be maintained under negative pressure and the extracted air will be passed through the bag filter and carbon bed prior to release to atmosphere. We note that there are many types of materials being brought into the facility. The intent is to achieve a solid fuel specification into the gasifier through appropriate blending and balancing. A fuel specification for the gasifier feed has been established and the process will be operated so the feed meets the specification.

C. Emission Estimations 17. Emission calculations are detailed in the ESDM Appendix A with our comments provided below.	The purpose of the auxiliary boiler will be to provide steam during start-up in order to produce sufficient dry-RDF while the thermal process is not operating, and for balancing the steam load during start-up of the gasification system as required. The use of this boiler is therefore expected to be limited to during start-up and the period immediately after annual maintenance shutdown. The natural gas combustion emissions from this source during startup will be lower than the emissions during the worst case operations that have been used in the HHRA. The Facility is committed to the lower baghouse loading concentrations of 5 mg/ m^3 and 10 mg/ m^3 as noted. These limits are achievable and will be incorporated in the design and specifications of the Facility.

Source to Atmosphere	**Yes/No**	**Comments**
A1 – Waste Reception & Fuel Preparation	Yes	Baghouse loading of 5 is low as compared to MOECC recommended 20 mg/ m^3 Odour emissions are controlled with RTO are acceptable
A2 – RDF Drier Exhaust	Yes	Baghouse loading of 5 is low as compared to MOECC recommended 20 mg/ m^3 Odour emissions are controlled with RTO are acceptable
A3 & A4 – Gas Plasma Extraction Exhaust	Yes/No	Baghouse loading of 10 is low as compared to MOECC recommended 20 mg/ m^3 No information provide on A4
A7 – Bypass Thermal Oxidizer	Yes	See below
A8 – Gas Engine Exhaust	Yes	See below
A11 – Direct Plasma Exhaust	Yes	See below
A9 – Auxiliary Steam Boiler	No	No information but Appendix F and ESDM note that the boiler will consume 8.5 MW of natural gas
A10 – Emergency Diesel Generator	Yes	Based on manufacture guarantee

18. Emissions from on-site vehicles have not been estimated including trucks, fork lifts, front end loaders as well as for building heating. These emissions should be calculated and included in modelling for environmental assessments.	Please see response to Comment 14

D. Gas Engine Exhaust 19. The size of the pilot engine, the load on the engine and the consumption rate of syngas are not provided in reports but it is likely they are smaller than the engines proposed for the Project. The volumetric flowrate for the pilot plant engine is 149 N m^3/hr or 0.041 N m^3/s as compared to 3.81 N m^3/s per engine (i.e., 26.71 N m^3/s divided by seven engines) for the Project. Extrapolating the emissions to a larger size may not be appropriate. Larger engines will tend to have inefficiencies and generate higher emissions. It is not apparent how the Project flowrates have been developed.	We are not aware of any evidence that larger engines generally have inefficiencies and generate higher emissions. Engine supplier information indicates similar efficiencies when comparing full-scale engine performance. This issue is not relevant in relation to the Swindon pilot scale engine. The PFMSI full scale engines will definitely be much more efficient than the Swindon pilot scale engine. Please also see response to Comment 8.
20. The in-stack concentrations are referenced to normal (N) conditions defined as 273K (0C), 101.3 kPa, dry and 11% O_2 while the Ontario in stack emission limits (as per MOECC A7 Guideline) are referenced to 298K (25C), 101.3 kPa, dry and 11% O_2 (i.e. R conditions). Table A.3 presents concentrations based on R conditions but they are actually Normal conditions.	The concentrations presented in Table A.3 are based on a reference condition to 273 degrees K rather than 298 degrees K. A correction of the concentrations to reference conditions of 298 degrees K results in lower concentrations and therefore there is no impact to the AQAR. The lower in-stack concentrations at 298 K will be indicated in Table A.3.
21. Table 4.b presents in-stack concentrations used for the Project based on the Durham-York EFW and emission factors for the Algonquin EFW which are both mass burn systems. The in-stack concentrations for the Durham-York EFW are referenced to R conditions not Normal conditions, so the wrong volume flowrate is used to calculate the emissions. The flowrate should be slightly greater for R conditions generating higher emission rates. Further, the use of emission factors based on hourly RDF is not appropriate given that the two technologies (gasification vs mass burner) are significantly different.	The conversion of the flowrate will result in an approximate small (about 10 percent) increase in emissions for the selected compounds. CRA has updated the emissions estimates and resulting modelled concentrations for the HHRA and we have determined that this change does not result in a significant change to the results or conclusions of the HHRA.

22. On AQAR Table 1, the in-stack concentrations after controls from the Project are compared to MOECC Guideline A-7 Air Pollution Control, Design and Operation Guidelines for Municipal Waste Thermal Treatment Facilities (October, 2010). The Ontario Guidelines are reference to R conditions while those used for the Project are Normal conditions. In addition, the TOC and CO were incorrectly transcribed from ESDM Table A.3 showing them to be two orders of magnitude greater than presented on Table 1 of the AQAR. This shows that the CO is well over the A-7 guideline value.	As stated in the Environmental Screening Report, Section 8.2, PFMSI is committed to achieving the levels set forth in Ontario Guideline A-7, including the A-7 guideline level for in stack CO concentrations. Also per the Environmental Screening Report, Section 8.2, CO concentrations will be monitored by a continuous emissions monitoring (CEM) system to ensure ongoing compliance. It is agreed that the in stack concentration assumed in the Emission Summary and Dispersion Modelling Report (ESDM) Table A3 is greater than the Ontario Guideline A-7 in stack concentration guideline of 40 mg/ m^3 and represents uncontrolled emissions. This has been corrected in the ESDM to indicate that the controlled emissions will meet the A-7 guidelines will be met as noted above. We have contacted local engine exhaust catalytic control suppliers and these controls can readily achieve a 90 to 95% reduction in CO. We used a 90% control assumption as a reasonably conservative estimate. The Swindon Plant source testing data for CO was utilized as a very conservative estimate for CO emissions from the PFMSI facility. The CO emissions and in stack concentrations presented in the ESDM Report are considered extremely conservative for the PFMSI facility because the engine at the Swindon pilot plant is a demonstration engine that operates with a very rich syngas stream and low flow and combustion temperatures. The PFMSI facility will have full scale engines with state of the art air and fuel mix controls. These engines will operate with much leaner fuel mixtures with air/fuel combustion controls and will operate at much higher combustion temperatures. We therefore expect that the PFMSI engines will have CO concentrations that are 99 percent lower than the Swindon engine CO concentrations.

	Source A8 mg/Nm^3	Source A8 mg/Rm^3	A-7 Guideline mg/Rm^3	% of A7
Total Organic Compounds (TOC)	27.2	24.92	33	75.5%
Carbon Monoxide	1456	1333.85	40	3334.6%
Hydrogen Chloride	0.52	0.48	27	1.8%
Nitrogen Oxides	44.27	40.56	198	20.5%
Sulphur Dioxide	20.16	18.47	56	33.0%
Total Particulate Matter	0.3	0.27	14	2.0%
Cadmium	0.0018	0.0016	0.007	23.6%
Lead	0.0058	0.0053	0.06	8.9%
Mercury	0.0005	0.0005	0.02	2.3%
Dioxins and Furans (TEQ) (pg/m^3)	17	15.57	80	19.5%

E. Bypass Thermal Oxidizer 23. Under hot standby, the Thermal Oxidizer consumes about 42 m^3/hr (1.5 MMBTU/hr) of natural gas or 440 kW. US EPA emission factors were used to calculate the emissions from the consumption of natural gas. A summary of the emissions is presented on ESDM Table A.5a but the Rated Capacity of the Thermal Oxidizer is presented at 29,029.022 BTU/hr or 8500 kW.	It is confirmed that the thermal oxidizer consumes approximately 1.5 MMBTU/hr of natural gas while on hot standby. The rated capacity presented in Table A.5a of the ESDM identifies the maximum capacity of 29 MMBTU/hr for hot standby, resulting in an overestimate of the emissions from the thermal oxidizer under normal operating conditions.
24. The stack exit temperature and flowrate is shown as 800C and 23.57 A m^3/s on ESDM Table 2.A. No reference or calculation is provided for the flowrate under ESDM Appendix A or Appendix E.	The flowrate and temperature for the bypass stack exhaust has been provided by the technology supplier APP.

25. Under Bypass Conditions, the off-spec syngas is conveyed to the Thermal Oxidizer and combusted. The quantity or composition of syngas is not provided in reports or Appendices. In ESDM Appendix A, the report states that the emission profile for the Thermal Oxidizer will be similar to that of the engines and emission data used for the engines can be used for the Thermal Oxidizer. Although the text states the emissions from the Thermal Oxidizer presented on ESDM Table A.5b the gaseous compounds (CO, etc.) in-stack concentrations (or emission factor) do not match those of Table A.4a or A.4.b but are provided in Appendix E. The NOx and CO emissions are lower in Table A5.b than provide in Appendix E. It is unclear how the reduction is achieved.	The quantity of syngas to be produced by the plant at the maximum operating capacity is approximately 17,762 N m^3/hr or 153,586,200 BTU/hr. An emissions profile for selected compounds for the thermal oxidizer, when processing syngas, was provided by the technology provider as identified in Appendix E. All other contaminants were assumed to have in-stack concentrations equivalent to those estimated for the Engine Stack (A8). This is a very conservative assumption because an oxidizer has a higher combustion efficiency than an engine due to much higher combustion temperature (1000 C) and residence time (one second). As identified in Appendix E, the emissions profile provided therein is representative of an exhaust stream with no thermal oxidizer control applied. Therefore, it was noted that the CO and NOx species had concentrations attributed that were above Guideline A-7 limits and therefore the Guideline A-7 limit was applied as the in stack concentration post thermal oxidizer as a conservative estimate for the bypass condition. This is conservative as the facility is committed to achieving the Guideline A-7 standards and is readily achievable through the thermal oxidizer mitigation.
26. The AQAR states that the Project “will be a reduction in carbon dioxide equivalent emissions because the facility will use existing waste including organic materials that will displace fossil fuel emissions and reduce methane”. No information is provided to support this claim on the amount of CO2e reduction. Given the information provided for the Bypass Thermal Oxidizer on hot standby and taking into account that it is operating 95% of the year, the amount of natural gas it would consume is 350,000 m^3/yr which is enough to heat about 160 homes. This amounts to over 700 tonnes CO2e/yr.	Gasplasma® technology offers a significantly reduced CO2 lifecycle footprint when compared to conventional municipal waste incineration, landfilling and electrical generation utilizing coal burn. The Gasplasma® process results in an avoidance of methane emissions from landfilling. Methane emissions have a higher global warming potential compared to CO2 emissions from the syngas utilization in engines. Conventional landfilling typically has a GHG flux of approximately +325 kg CO2 per tonne of MSW input, while conventional electricity generation from coal burn is approximately +900 kg CO2 per MWh. Gasplasma technology offers a GHG flux of approximately -543 kg Co2 per tonne of MSW, or -341 kg CO2 per MWh. Note that the CO2e calculation of 700 tonnes per year from the Bypass Thermal Oxidizer is not correct because it is based on the oxidizer operating at full BTU/hr capacity rather than at standby BTU/hr capacity. There was a typo in the AQAR that indicated that the oxidizer was running at full capacity and this will be corrected.

27. Direct Plasma (A11) is used to extract precious metal dust from steel shavings or turnings but the AQAR states that it can accept contaminant soils. The data provided only addresses stainless steel waste. i. Start-up and shut down conditions are not addressed. ii. The system adds lime and coke to the process but no information is provided on storage, handling of these two feeds.	The primary function of the Direct Plasma unit is to extract metals, such as zinc, from metal and steel waste. The unit also has the capability to process contaminated soils; however the facility will only process non-hazardous materials. Therefore, all soils processed will contain contaminants at the non-hazardous level. When processing soils, the direct plasma process volatizes any organics that are present and they are captured or destroyed within the thermal oxidizer. Any metals gravitate back into the unit for recovery and the remaining soil and compounds are formed into the Plasmarok material. The Direct Plasma system is well established technology for this purpose with full-scale operations. The start-up and shut-down procedures for the direct plasma system are as described above for Comment 13, regardless of the feed material being used. Details of the receipt and storage of lime and coke are provided in Section 6.1 of the D&O Report. Additional details on the formulation and blending system are described in Section 6.2 of the D&O Report.
F. Dispersion Modelling 28. Modelling for airborne concentrations was carried out following the MOECC guidelines (*Air Dispersion Modelling Guideline for Ontario*) and detailed in Appendix B - ESDM report of Appendix F using the MOECC accepted model AERMOD. MOECC pre-processed meteorological data (2004-2008) and terrain data were also utilized.	Acknowledged and agree that AERMOD is an appropriate and approved model.
29. As per guideline, a nested receptor grid out to 5 km was used to evaluate the impact of the Project. The grid was extended to 10 km as initial results showed the impact to be near the 5 km limit as well as the addition of three sensitive receptor grid groups around the communities of Keith, South Sherman and Hamilton Mountain. These four receptor grids were used to determine the maximum airborne concentrations of the various compounds.	Acknowledged.

30. The following sources under the Normal and Bypass Oxidizer Scenarios were identified as elevated point sources (i.e. stacks).	Acknowledged.

Source to Atmosphere	Normal	Bypass Oxidizer
A1 – Waste Reception & Fuel Preparation	Yes	Yes
A2 – RDF Drier Exhaust	Yes	Yes
A3 & A4 – Gas Plasma Extraction Exhaust	Yes	Yes
A7 – Bypass Thermal Oxidizer	Hot-Stand-by	Yes
A8 – Gas Engine Exhaust	Yes	No
A11 – Direct Plasma Exhaust	Yes	Yes
A9 – Auxiliary Steam Boiler	Yes	Yes
A10 – Emergency Diesel Generator	Yes	Yes

31. Emissions from on-site equipment, trucks and roads were not included in the modelling. In addition, emissions from building ventilation including comfort heating or indoors mobile equipment were not included. As part of environmental assessment these sources should be addressed.	Please see response to Comment 14 above. The only mobile emissions of concern are the delivery and waste vehicle emissions on the site roads and these have now been added to the air assessment and HHRA. The indoor mobile equipment emissions and comfort heating equipment emissions are insignificant.
32. Five years of processed meteorological data from the MOECC was obtained based on the Woodward station for the years 2004-2008. A more recent meteorological data set which coincides with the ambient air monitoring data would have been preferred. It is unclear if this data set also included precipitation which would be used for deposition modelling.	The MOECC processed data represented the most recent data that they possessed. MOECC processed two data sets: one that contained precipitation for deposition modeling purposes; and one that did not contain precipitation for ESDM/ECA application purposes with the understanding that if the “no precipitation” data set would be used for an ESDM/ECA application, a Section 13 application for use of site-specific meteorological data would be submitted. As the “no precipitation” data set was used for ESDM/ECA purposes, a Section 13 application was submitted and approved. A Section 13 was not required nor requested by MOECC for the site-specific meteorological data set that contained precipitation data for use with deposition modeling.
33. Modelling also allowed for building and stack tip downwash in calculating hourly, 24-hr and annual concentrations over the 5-year period. AERMOD calculates concentrations (and deposition) on an hour by hour basis over the entire computational grids described above. In addition, airborne concentrations were calculated without deposition (i.e. plume depletion) which maximises the airborne levels. These are acceptable assumptions.	Acknowledged

34. As the Project will be located in an industrial area with US Steel and ArcelorMittal Dofasco, who have a large thermal footprint, the AERMOD URBANOPT which accounts for large surface heating should have been used. This will change the dispersion effects and change the location and magnitude of the impacts.	It is expected that the use of the URBANOPT will decrease predicted air concentrations due to the additional dispersion created by the buoyant land mass air. Therefore this will not affect the results of the HHRA. CRA has conducted new AERMOD dispersion runs using the URBANOPT for key indicator compounds with the highest risk levels and we have confirmed that there are no significant changes to the results and conclusions of the HHRA
35. It is unclear how AERMOD was executed as the electronic files or copies on the input files are not on- line. The AQAR suggests that only the major sources engine stack (A8), Bypass Thermal Oxidizer (A7) and Direct Plasma (A11) were modelled individually and not as an aggregate or multi-stack scenario. The three stacks have different stack parameters which will not generate a realistic impact. As shown on AQAR Table 2A (Table 4A of ESDM), for the Normal Operating Condition, the facility wide emissions were modelled as if released through Source A8 as stated in Footnote 2. For the Bypass Operating Conditions (AQAR Table 2B; ESDM Table 4B), facility wide emissions are release through Source A7. Clarification is needed as why this was carried out and whether this was carried out for all compounds.	The source of emissions from the Facility were modelled using their individual stack parameters. Contaminants emitted from more than one source were modelled utilizing the source specific emission rate for each respective source. For those contaminants that are emitted only from syngas combustion, a unitized emission rate and the resulting dispersion factor was applied. Source A8 (Power Generation exhaust) and Source A7 (Bypass Oxidizer) are the only sources of syngas combustion emissions. They are modelled separately in the Normal or Bypass scenarios, therefore we were able to use dispersion factors for those runs to simplify the modelling.
36. The Normal Operating Scenario assumes all seven (7) gas engines are on-line and exhaust gases are conveyed and vented through A8 which is the maximum production scenario. When less than seven units are in operation, the volume of exhaust gas will be reduced through A8 and this will generate a lower plume rise and potentially higher concentrations, even though fewer emissions are released. The sensitivity to operating less than seven engines has not been examined to demonstrate the potential impact.	CRA has assessed scenarios with less than 7 engines operating. The reduced momentum and buoyancy dispersion that results from less than 7 engines operating is offset by the mass reduction of air contaminant mass emissions, with the net result being a decrease in off-site contaminant concentrations. Therefore the 7 engines operating scenario represents the worst case for the HHRA. A qualitative discussion of the potential emissions during startup, shutdown and operation of less than 7 engines will be added to the Air Study.
37. While there is no AAQC for PM2.5, the MOECC has set a guideline 25 µg/m³ for a single source to meet the Canada Wide Standard of 30 µg/m³. As shown in ESDM Table 4A and 4B, the Project is predicted to contribute 22.7 µg/m³ at the maximum point of impact as compared to the background of 16.3 µg/m³ (Table 1 of Appendix A – Ambient Air Monitoring).	Acknowledged

38. For PM2.5, the Canada Wide Standard is calculated as the running 3-year average of the annual 98th percentile of the daily ambient measurements (MOECC, 2011). New Canadian Ambient Air Quality Standards (CAAQS) for particulate matter are set to be implemented in 2015 and include 24 hour and annual averages. A 24-hour average PM2.5 CAAQS of 28 µg/m³ will apply starting in 2015, and will be reduced to 27 µg/m³ in 2020. Starting in 2015, the annual PM2.5 CAAQS will be 10 µg/m³, which will be reduced to 8.8 µg/m³ in 2020.	Acknowledged
G. Deposition Modelling 39. Deposition modelling was carried out in a similar fashion as the dispersion modelling but with plume depletion and wet and dry deposition options in the AERMOD model turned on. The annual deposition rates (or flux) of various compounds to the surface at the four gridded receptor groups were calculated. The airborne concentrations and deposition fluxes were provide to HHRA for further processing. The airborne concentrations passed to the HHRA with deposition are likely less than those found in the ESDM since plume depletion is included in the HHRA concentrations.	Acknowledged