7.8 Exhibit A attached hereto is incorporated herein by reference and made a part hereof for all purposes.

7.9 The parties hereby agree, subject to the primary jurisdiction of the National Energy Board, that any dispute arising out of or relating to this Agreement, or any breach thereof shall be submitted to final and binding arbitration in Toronto, Ontario in accordance with the Commercial Arbitration and Mediation Procedures of the American Arbitration Association (AAA) then in effect. The dispute shall be decided by a panel of three neutral arbitrators, qualified by education, training, and experience to hear the dispute, chosen as follows. The party initiating the arbitration proceeding shall name one arbitrator at the time it notifies the other party of its intention to arbitrate their dispute, and the responding party shall name an arbitrator within fifteen (15) days of receiving the above notification. Within twenty (20) days of the appointment of the second arbitrator, the two arbitrators shall select a third arbitrator to act as chairman of the tribunal. If either party fails to appoint an arbitrator within the allotted time or the two party-appointed, neutral arbitrators fail to appoint a third arbitrator as provided above, the AAA shall appoint the arbitrator(s). Any vacancies will be filled in accordance with the above procedure. The parties expressly agree to the consolidation of separate arbitral proceedings for the resolution in a single proceeding of all disputes that arise from the same factual situation, and the parties further expressly agree that any issue of arbitrability or the existence, validity, and scope of the agreement to arbitrate shall be decided by the arbitrators. The parties further agree that either party may apply to a court of competent jurisdiction, pending arbitration, for injunctive relief to preserve the status quo, to preserve assets, or to protect documents from loss or destruction, and such application will not be deemed inconsistent with or operate as a waiver of the party'□s right to arbitration. The arbitrators shall apply as the substantive law to the dispute the laws of Ontario, as specified in section 7.1 of this Agreement.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement in one or more counterparts, which counterparts shall constitute one integrated agreement, by their duly authorized officers effective as of the day first above written.

VECTOR PIPELINE LIMITED PARTNERSHIP
By VECTOR PIPELINE LIMITED
As General Partner
(Transporter)

_____ By: _____
Date

Title: _____

(Customer)

_____ By: _____

Date

Title: _____

EXHIBIT A
TO
TITLE TRANSFER SERVICE AGREEMENT
UNDER TOLL SCHEDULE TTS

Title Transfer Point	Meter Identification Number
As identified on the Vector web site.	As identified on the Vector web site.

FORM OF AGREEMENT FOR MANAGEMENT OF BALANCING AGREEMENT SERVICES

AGREEMENT FOR MANAGEMENT OF BALANCING AGREEMENT SERVICES
VECTOR PIPELINE LIMITED PARTNERSHIP

Management of Balancing Agreement Services Agreement No. _____

This AGREEMENT FOR MANAGEMENT OF BALANCING AGREEMENT SERVICES ("**Management of Balancing Agreement" or "Agreement**") is made and entered into this _____ day of _____, _____, by and between:

VECTOR PIPELINE LIMITED PARTNERSHIP, ("Transporter"),

and

_____, ("Balancing Provider").

Witnesseth: That in consideration of the mutual covenants herein the parties agree as follows:

Section 1. Government Authority

1.1 This Agreement is subject to all valid legislation with respect to the subject matters hereof, and to all valid present and future decisions, orders, rules, regulations and ordinances of all duly constituted governmental authorities having jurisdiction.

Section 2. Quantity of Gas and Priority of Service

2.1 Quantities of Gas and points to be balanced under Toll Schedule MBA will be as specified in Balancing Provider's schedule to be provided to Transporter.

2.2 The service under this Agreement shall be conditioned upon the availability of capacity sufficient to provide the service without detriment or disadvantage to those customers of Transporter that have a higher priority of service.

2.3 Prior to initiation of service, Balancing Provider shall provide Transporter with all information identified in Transporter's General Terms and Conditions ("GT&C) and as set forth in Toll Schedule MBA or as otherwise required by the National Energy Board.

Section 3. Term of Agreement

3.1 This Agreement shall be effective as of the date hereof and shall continue in full force and effect until _____, subject to cancellation by Transporter, at its discretion, in the event Balancing Provider does not utilize the MBA service in any twelve (12) consecutive months.

Section 4. Points of Receipt and Balancing

4.1 The point(s) of receipt and delivery of Gas and the point(s) to be balanced by Transporter is (are) as designated in Exhibit A, attached hereto.

Section 5. Operating Procedure

5.1 Balancing Provider shall conform to the operating procedures set forth in Transporter's GT&C.

Section 6. Toll(s), Toll Schedules and General Terms and Conditions of Service

6.1 Balancing Provider shall pay Transporter, each month for which the MBA service is provided, for services rendered pursuant to this Agreement in accordance with Transporter's Toll Schedule MBA, or superseding toll schedule(s), on file with and subject to the jurisdiction of the National Energy Board.

6.2 Unless otherwise mutually agreed to, Balancing Provider shall pay Transporter for services hereunder the maximum applicable tolls and charges, as established under Toll Schedule MBA and set forth on the Statement of Tolls in Transporter's effective National Energy Board Gas Tariff, including any applicable surcharges.

6.3 Transporter shall have the unilateral right from time to time to propose and file with the National Energy Board such changes in the tolls and charges applicable to Management of Balancing Agreement service pursuant to this Agreement, the toll schedule(s) under which this service is hereunder provided, or any provisions of Transporter's GT&C applicable to such services. Balancing Provider shall have the right to protest any such changes proposed by Transporter and to exercise any other rights that Balancing Provider may have with respect thereto.

Section 7. Miscellaneous

7.1 This Agreement shall be interpreted according to the laws of the Province of Ontario.

7.2 Unless herein provided to the contrary, any notice called for in this Agreement shall be in writing and shall be considered as having been given if delivered by certified mail or fax with all postage or charges prepaid, to either Transporter or Shipper, at the

location designated herein. Written communications shall be considered as duly delivered when received by ordinary mail. Unless otherwise notified in writing, the addresses of the parties are as follows:

Transporter: Vector Pipeline, Limited Partnership
c/o Vector Pipeline Limited
Attention: President
38705 Seven Mile Road, Suite 490
Livonia, Michigan 48152
United States

Balancing Provider: Company
Address
City, State, Zip
Attention:
Telephone: (xxx) xxx-xxxx
Fax: (xxx) xxx-xxxx

Wire transfer payments to Transporter shall be accompanied with the instructions "to credit the account of Vector Pipeline Limited Partnership." and shall be sent to the following bank and account number:

Vector Pipeline Limited Partnership
Toronto Dominion Bank - Edmonton
Edmonton, AB
Account Number: 0701 0572337
Bank Code/Transit Number: 004-82389
SWIFT: TDOMCATT

Remittance detail supporting wire transfer payments to Transporter, and any notice, request or demand regarding statements, bills, or payments shall be mailed to the following address:

Vector Pipeline Limited Partnership
c/o Vector Pipeline Limited
38705 Seven Mile Road, Suite 490
Livonia, Michigan 48152
Attention: President

7.3 A waiver by either party of any one or more defaults by the other hereunder shall not operate as a waiver of any future default or defaults, whether of a like or of a different character.

7.4 This Agreement may only be amended by an instrument in writing executed by both parties hereto.

7.5 Nothing in this Agreement shall be deemed to create any rights or obligations between the parties hereto after the expiration of the term set forth herein, except that

termination of this Agreement shall not relieve either party of the obligation to correct any quantity imbalances or Balancing Provider of the obligation to pay any amounts due hereunder to Transporter.

7.6 Exhibit A attached hereto is incorporated herein by reference and made a part hereof for all purposes.

7.7 Performance of this Agreement shall be subject to all valid laws, orders, decisions, rules and regulations duly constituted governmental authorities having jurisdiction or control of any matter related hereto. Should either of the parties, by force of any such law, order, decision, rule or regulation, at any time during the term of this Agreement be ordered or required to do any act inconsistent with the provisions hereof, then for the period during which the requirements of such law, order, decision, rule or regulation are applicable, this Agreement shall be deemed modified to conform with the requirement of such law, order, decision, rule or regulation; provided, however, nothing in this section 7.7 shall alter, modify or otherwise affect the respective rights of the parties to cancel or terminate this Agreement under the terms and conditions hereof.

7.8 The parties hereby agree, subject to the primary jurisdiction of the National Energy Board, that any dispute arising out of or relating to this Agreement, or any breach thereof shall be submitted to final and binding arbitration in Toronto, Ontario in accordance with the Commercial Arbitration and Mediation Procedures of the American Arbitration Association (AAA) then in effect. The dispute shall be decided by a panel of three neutral arbitrators, qualified by education, training, and experience to hear the dispute, chosen as follows. The party initiating the arbitration proceeding shall name one arbitrator at the time it notifies the other party of its intention to arbitrate their dispute, and the responding party shall name an arbitrator within fifteen (15) days of receiving the above notification. Within twenty (20) days of the appointment of the second arbitrator, the two arbitrators shall select a third arbitrator to act as chairman of the tribunal. If either party fails to appoint an arbitrator within the allotted time or the two party-appointed, neutral arbitrators fail to appoint a third arbitrator as provided above, the AAA shall appoint the arbitrator(s). Any vacancies will be filled in accordance with the above procedure. The parties expressly agree to the consolidation of separate arbitral proceedings for the resolution in a single proceeding of all disputes that arise from the same factual situation, and the parties further expressly agree that any issue of arbitrability or the existence, validity, and scope of the agreement to arbitrate shall be decided by the arbitrators. The parties further agree that either party may apply to a court of competent jurisdiction, pending arbitration, for injunctive relief to preserve the status quo, to preserve assets, or to protect documents from loss or destruction, and such application will not be deemed inconsistent with or operate as a waiver of the party'□s right to arbitration. The arbitrators shall apply as the substantive law to the dispute the laws of Ontario, as specified in section 7.1 of this Agreement.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement in one or more counterparts, which counterparts shall constitute one integrated agreement, by their duly authorized officers effective as of the day first above written.

VECTOR PIPELINE LIMITED PARTNERSHIP
By VECTOR PIPELINE LIMITED
As General Partner
(Transporter)

_____ By: _____
Date

Title: _____

(Balancing Provider)

_____ By: _____
Date

Title: _____

EXHIBIT A TO
AGREEMENT FOR
MANAGEMENT OF BALANCING AGREEMENT SERVICE
UNDER TOLL SCHEDULE MBA

I. Contact Information

Balancing Customer

_____

_____

_____

_____

_____

II. Balancing Point(s): _____

III. Market Point: _____

IV. Balancing Terms and Conditions:

Balancing Provider's Transportation Agreement(s) _____

Maximum Hourly Quantity Under the Agreement_____

Limitation on the Number of Hours of Balancing per Day _____

Maximum Imbalance Coverage per Day _____

Effective Period of Balancing Service _____

Term of the Agreement_____

FORM OF AGREEMENT FOR OPERATIONAL BALANCING AGREEMENT

OPERATIONAL BALANCING AGREEMENT
BETWEEN
VECTOR PIPELINE LIMITED PARTNERSHIP
AND
_____

This OPERATIONAL BALANCING AGREEMENT ("OBA" or "Agreement") is made and entered into by and between Vector Pipeline Limited Partnership ("Vector"), with an office at 38705 Seven Mile Road, Suite 490 Livonia, Michigan 48152 United States and _____ ("Shipper"), with offices at _____ (collectively the "Parties" or individually as "Party"), this ____ day of _____, _____.

WITNESSETH

WHEREAS, the facilities operated or to be operated by Vector and Shipper are at a location(s) specified in the Exhibit 1 attached hereto and incorporated herein by this reference (hereinafter referred to as "Location," whether one or more); and

WHEREAS, Vector and/or Shipper (at times hereinafter referred to as the "Parties" or individually as a "Party") have entered into one or more agreements with third party service requesters (hereinafter referred to as "Service Requester(s)") for the transportation of Gas to or from the Location on their respective systems (said agreements hereinafter referred to as "Service Requester Agreements"); and

WHEREAS, from time to time, the quantities of Gas confirmed and scheduled by the parties to be delivered to or received from the Location (said quantities hereinafter referred to as the "Scheduled Quantities") may be greater or lesser than the quantities of Gas which are actually delivered at the Location, resulting in over or under-deliveries relative to Scheduled Quantities; and

WHEREAS, the Parties desire to implement an operational balancing agreement in order to facilitate more efficient operations, accounting, and systems management at the Location and on the Parties' respective systems.

[Additional WHEREAS clauses as necessary]

NOW, THEREFORE, in consideration of the premises and mutual covenants contained herein, the Parties agree as follows:

1. Prior to the date and time of flow at each Location, the Parties shall confirm and schedule nominations which will be delivered or received at each Location. Such

_____[1] between the Parties shall be made _____,[2] unless otherwise mutually agreed to by the Parties.

2. The Parties intend that the quantity of Gas actually delivered and received each day at each Location will equal the Scheduled Quantities for that location. Each Party will allocate quantities which have been delivered and received at each Location among the Service Requester Agreements on its system pursuant to the Scheduled Quantities at such locations. Any imbalance created, when the actual physical flow is different than the Scheduled Quantities, will be the "Operational Imbalance," which will be the responsibility of the Parties to eliminate pursuant to this Agreement. [Parties may establish a maximum Operational Imbalance and procedures for immediate or accelerated resolution if such maximum is reached.]

3. Estimated operating quantities flowing at each Location shall be used _____[3] during any current period to determine the estimated Operational Imbalance at such Location, with physical flow adjustments to be made during that current period as mutually agreed to by both Parties to attempt to maintain or achieve an Operational Imbalance of zero at such point; provided, however, _____.[4]

4. a. The actual measured quantity of Gas at the Location each month shall be determined and communicated by the measuring party ("Measuring Party") by facsimile, electronic interface system or in writing to the other Party in accordance with NAESB Standard 2.3.7. The actual measured quantity shall be determined pursuant to the applicable provisions of the Measuring Party's Tariff or applicable measurement procedures. Operational Imbalances shall be calculated initially by the measuring Party and shall be agreed to _____[5] by the Parties prior to the _____ Day of such period.

b. Operational imbalances shall be resolved as follows:

_____
_____.[6]

5. In the event that a capacity constraint occurs in either Party's system which results in curtailment of quantities through a location, _____.[7]

6. This Agreement is entered into in order to facilitate operations and accounting between the Parties, and shall have no effect upon the Service Requester Agreements or upon the effectiveness of any Party's Gas Tariff or General Terms and Conditions.[8]

7. [Establish a procedure by which locations are added to or deleted from this Agreement or Exhibit 1.]

8. Notwithstanding the termination of this Agreement, the Parties agree to reconcile and eliminate any remaining Operational Imbalance pursuant to the terms and conditions

of this Agreement within _____ of termination of this Agreement or such other period of time which is mutually agreed to by the Parties.

9. This Agreement and the terms and conditions herein are subject to all present and future valid laws, orders, rules and regulations of duly constituted authorities having jurisdiction.

10. In the event a conflict exists or arises between this Agreement and a Parties' Gas Tariff or General Terms and Conditions, as amended from time to time, it is agreed and understood that the latter shall prevail.

11. This Agreement is for accounting and system management purposes only, and is entered into by the Parties with the understanding that the balancing activities provided for hereunder are not intended to subject any non-jurisdictional entity to regulation by the National Energy Board under the provisions of its rules, regulations and legislation. If, at any time, it should be determined that such balancing activities do result in such regulation, then this Agreement shall immediately terminate, and any remaining Operational Imbalance shall be resolved by the Parties within _____ after termination of this Agreement.

12. Any entity which shall succeed by purchase, merger or consolidation to the properties, substantially as an entity, of either Party, shall be subject to the obligations of its predecessor to this Agreement. No other assignment of this Agreement or of any of the rights or obligations hereunder shall be made.

13. AS TO ALL MATTERS OF CONSTRUCTION AND INTERPRETATION, THIS AGREEMENT SHALL BE INTERPRETED IN ACCORDANCE WITH THE LAWS OF THE PROVINCE OF ONTARIO.

14. Any notice, request, or statement provided pursuant to this Agreement shall be in writing and shall be considered as having been given, if delivered personally, when delivered, or, if either electronically communicated, mailed, postage prepaid, sent by express mail, or overnight delivery, or if faxed to the other Party, then, when sent, to the following:

Transporter: Vector Pipeline Limited Partnership
c/o Vector Pipeline Limited
38705 Seven Mile Road, Suite 490
Livonia, Michigan 48152
United States

Shipper: Company
Address
City, State, Zip
Attention:
Telephone: (xxx) xxx-xxxx

Fax: (xxx) xxx-xxxx

Changes to the above addresses shall be effectuated by a Party notifying the other Party in writing of the modification.

15. A waiver by either Party of any one or more defaults by the other Party hereunder shall not operate as a waiver of any future default or defaults, whether of like or different character.

16. [Additional provisions as necessary.][9]

17. The Effective Date of this Agreement shall be _____ ___, _____.

18. The primary term of this agreement shall be from the Effective Date until _____ and month to month thereafter unless terminated upon 10 days prior written notice.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement in one or more counterparts, which counterparts shall constitute one integrated agreement, by their duly authorized officers as of the day first above written.

VECTOR PIPELINE LIMITED PARTNERSHIP
By VECTOR PIPELINE LIMITED
As General Partner
(Transporter)

_____ By: _____
Date

Title: _____

(Shipper)

_____ By: _____
Date

Title: _____

EXHIBIT 1 TO

OPERATIONAL BALANCING AGREEMENT
BETWEEN
VECTOR PIPELINE LIMITED PARTNERSHIP

and

_____

Dated _____

LOCATION(S)

PARTY NAME[10]	D-U-N-S™	PROPRIETY GAS TRANSACTION	DRN. No.	DESCRIPTION	POINT CODE

[Add any instructions or further provisions, if necessary.]

_____
(A registered trademark of Dun & Bradstreet Corporation)

OPERATIONAL BALANCING AGREEMENT

INSTRUCTION SHEET

1. For paragraph 1, the first insert: Possible inserts include but are not limited to, for example: "reconciliation and confirmation," "discussion," or "verification."

2. For paragraph 1, the second insert: Possible inserts include but are not limited to, for example "verbally," "verbally with subsequent confirmation in writing," "in writing" or "electronically."

3. For paragraph 3, the first insert: Possible inserts include but are not limited to, for example: "on a daily basis" or it may be left blank.

4. For paragraph 3, the second insert: Possible inserts include but are not limited to, for example: whatever the parties agree upon for rescheduling during the period.

5. For paragraph 4a, the insert: Possible inserts include but are not limited to, for example "verbally," "verbally with subsequent confirmation in writing," "in writing" or "electronically."

6. For paragraph 4b, the first insert: Possible inserts include but are not limited to, for example: procedures for in-kind balancing, procedures for cash out, procedures for a combination of the two, some other mutually agreed procedure, or as provided by regulatory or contractual provisions.

7. For paragraph 5, the insert: Possible inserts include but are not limited to, for example "the Party on whose system the constraint has occurred shall determine the confirmation of quantities to the Service Requester(s) under the affected Service Requester Agreements. Such change in Scheduled Quantities shall be confirmed _____ [see Instruction 2] as required by Paragraph 1 above. If the constraint occurs at the Location, the operator of the Location shall determine the confirmation of quantities to the Service Requester(s) under the affected Service Requester Agreements, unless otherwise mutually agreed."

8. For paragraph 6, this paragraph may be deleted if the Agreement is contained within the Party's Gas Tariff or General Terms and Conditions.

9. For paragraph 16, optional merger language may be added such as: "This Agreement and the Exhibit(s) constitute the complete agreement of the parties relating to the matters specified in this Agreement and supersede all prior representations or agreements, whether oral or written, with respect to such matters."

10. For Exhibit 1, the column entitled "Party Name" should include entries for each interconnected party, for example: "party 1" and "party 2."

FORM OF FT- _____ FIRM TRANSPORTATION AGREEMENT
TEMPORARY ASSIGNMENT AGREEMENT

TEMPORARY ASSIGNMENT AGREEMENT FOR
FT-_____ FIRM TRANSPORTATION AGREEMENT OF NATURAL GAS
VECTOR PIPELINE LIMITED PARTNERSHIP

Number: _____

This TEMPORARY ASSIGNMENT AGREEMENT FOR THE TEMPORARY ASSIGNMENT OF A FIRM TRANSPORTATION AGREEMENT ("ASSIGNMENT") is made and entered into this _____ day of _____, _____, by _____ ("Assignor") and _____ ("Assignee").

1. Assignor hereby assigns to Assignee, Assignor's service entitlement as the Shipper under a Firm Transportation Agreement with Vector, to the extent specified in paragraph 2 herein, together with the corresponding rights and obligations of Assignor as Shipper under such Firm Transportation Agreement and Vector's NEB Transportation Tariff, as the same may be hereafter revised or superseded.

2. The Transportation service assigned herein to Assignee consists of the following

Volume: _____GJ/day under Shipper's FT___ Firm Transportation Agreement No. _____ (the "Assigned Volume").

Term of Assignment: Commencing _____, _____ and terminating _____, _____.

Toll: _____.

3. During the term of this Assignment, Assignee shall perform and observe the covenants and obligations of Assignor as Shipper contained in the specified Firm Transportation Agreement and Vector's Tariff in so far as they pertain to the Assigned Volume, to the same extent as Assignee would be obligated so to do were Assignee a party to the specified Firm Transportation Agreement as Shipper.

4. Assignee acknowledges that Assignor will not seek Vector's consent to this Assignment and that Assignee will be required to satisfy Vector's Tariff creditworthiness standards in order to obtain service under the specified Firm Transportation Agreement. Accordingly, Assignor will remain obligated to Vector to perform and observe the covenants and obligations of Shipper contained in the specified Firm Transportation Agreement and the Vector Tariff in regard to the Assigned Volume in so far as Vector is concerned. Consequently, Assignee shall indemnify Assignor for and hold Assignor harmless from all charges that Vector may be entitled to collect from Assignor under the specified Firm Transportation Agreement and Vector's Tariff in regard to the Assigned Volume in the event that Assignee fails to satisfy its obligations to Vector thereunder.

5. This Assignment and the rights and obligations of the parties hereunder are subject to all valid and applicable present and future laws, rules, regulations, and orders of any governmental or regulatory authority having jurisdiction or control over the parties hereto or either of them, the specified Firm Transportation Agreement and Vector's Tariff.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement in one or more counterparts, which counterparts shall constitute one integrated agreement, by their duly authorized officers effective as of the day first above written.

(Assignor)

_____ By: _____
Date

Title: _____

(Assignee)

_____ By: _____
Date

Title: _____

FORM OF OPERATIONAL VARIANCE SERVICE AGREEMENT

AGREEMENT FOR OPERATIONAL VARIANCE SERVICE UNDER TOLL SCHEDULE OVS VECTOR PIPELINE LIMITED PARTNERSHIP

Operational Variance Service Agreement No. _____

This AGREEMENT FOR OPERATIONAL VARIANCE SERVICE **("OVS Agreement" or "Agreement"**) is made and entered into this __ day of _____, __, between:

VECTOR PIPELINE LIMITED PARTNERSHIP, ("Transporter"),

and

_____, ("Shipper").

Witnesseth: That in consideration of the mutual covenants contained herein the parties agree as follows:

Section 1. Service to be Rendered

Transporter shall perform and Shipper shall receive service in accordance with the provisions of Transporter's effective Toll Schedule OVS and the applicable General Terms and Conditions of Transporter's Gas Tariff on file with the National Energy Board ("NEB") as the same may be amended or superseded in accordance with the rules, regulations and legislation of the NEB.

Section 2. Term

2.1 This Agreement shall be effective from the date hereof (the "Effective Date"). Transporter's obligation to provide Operational Variance Service and Shipper's obligation to accept and pay for such service, shall commence on _____ for a term of _____, unless otherwise agreed to by mutual agreement of the parties.

2.2 Shippers paying negotiated tolls may extend the term of this Agreement under terms acceptable to Transporter.

Section 3. Tolls

3.1 Shipper shall pay Transporter, each month for which the OVS service is provided, for services rendered pursuant to this Agreement in accordance with Transporter's Toll Schedule OVS, or superseding toll schedule(s), on file with and subject to the jurisdiction of the National Energy Board.

3.2 Unless otherwise mutually agreed to, Shipper shall pay Transporter for services hereunder the maximum applicable tolls and charges, as established under Toll Schedule OVS and set forth on the Statement of Tolls in Transporter's effective National Energy Board Gas Tariff, including any applicable surcharges.

3.3 Shipper shall pay Transporter for any applicable Daily Overrun Charges, calculated in accordance with Toll Schedule OVS.

3.4 Transporter shall have the unilateral right from time to time to propose and file with the National Energy Board such changes in the tolls and charges applicable to Operational Variance Service pursuant to this Agreement, the toll schedule(s) under which this service is hereunder provided, or any provisions of Transporter's GT&C applicable to such services. Shipper shall have the right to protest any such changes proposed by Transporter and to exercise any other rights that Shipper may have with respect thereto.

Section 4. Notices

Unless herein provided to the contrary, any notice called for in this Agreement shall be in writing and shall be considered as having been given if delivered by certified mail or fax with all postage or charges prepaid, to either Transporter or Shipper at the location designated herein. Written communications shall be considered as duly delivered when received by ordinary mail. Unless otherwise notified in writing, the addresses of the parties are as set forth herein.

Notices to Transporter under this Agreement shall be addressed to Transporter's Web Site (www.vector-pipeline.com), or to:

Vector Pipeline Limited Partnership
c/o Vector Pipeline Limited
38705 Seven Mile Road, Suite 490
Livonia, Michigan 48152
United States
Attention: President

Notices to Shipper under this Agreement shall be addressed to:

Company
Address
City, State, Zip
Attention:____
Telephone: (xxx) xxx-xxxx
Fax: (xxx) xxx-xxxx

Wire transfer payments to Transporter shall be accompanied with the instructions "to credit the account of Vector Pipeline Limited Partnership." and shall be sent to the following bank and account number:

Vector Pipeline Limited Partnership
Toronto Dominion Bank - Edmonton
Edmonton, AB
Account Number: 0701 0572337
Bank Code/Transit Number: 004-82389
SWIFT: TDOMCATT

Remittance detail supporting wire transfer payments to Transporter, and any notice, request or demand regarding statements, bills, or payments shall be mailed to the following address:

Vector Pipeline Limited Partnership
c/o Vector Pipeline Limited
38705 Seven Mile Road, Suite 490
Livonia, Michigan 48152
Attention: President

Section 5. Superseded Agreements

This OVS Operational Variance Service Agreement supersedes and cancels as of the effective date hereof the following agreements:

_____, _____

Section 6. Miscellaneous

6.1 This Agreement shall be interpreted according to the laws of the Province of Ontario.

6.2 Performance of this Agreement shall be subject to all valid laws, orders, decisions, rules and regulations of duly constituted governmental authorities having jurisdiction or control of any matter related hereto. Should either of the parties, by force of any such law, order decision, rule or regulation, at any time during the term of this Agreement be ordered or required to do any act inconsistent with the provisions hereof, then for the period during which the requirements of such law, order, decision, rule or regulation are applicable, this Agreement shall be deemed modified to conform with the requirement of such law, order, decision, rule or regulation; provided, however, nothing in this section 6.2 shall alter, modify or otherwise affect the respective rights of the parties to cancel or terminate this Agreement under the terms and conditions hereof.

6.3 A waiver by either party of any one or more defaults by the other hereunder shall not operate as a waiver of any future default or defaults, whether of a like or of a different character.

6.4 This Agreement may only be amended by an instrument in writing executed by both parties hereto.

6.5 Nothing in this Agreement shall be deemed to create any rights or obligations between the parties hereto after the expiration of the term set forth herein, except that termination of this Agreement shall not relieve either party of the obligation to correct any quantity imbalances or Shipper of the obligation to pay any amounts due hereunder to Transporter.

6.6 Exhibit A attached hereto is incorporated herein by reference and made a part hereof for all purposes.

6.7 The parties hereby agree, subject to the primary jurisdiction of the National Energy Board, that any dispute arising out of or relating to this Agreement, or any breach thereof shall be submitted to final and binding arbitration in Toronto, Ontario in accordance with the Commercial Arbitration Rules and Mediation Procedures of the American Arbitration Association (AAA) then in effect. The dispute shall be decided by a panel of three neutral arbitrators, qualified by education, training, and experience to hear the dispute, chosen as follows. The party initiating the arbitration proceeding shall name one arbitrator at the time it notifies the other party of its intention to arbitrate their dispute, and the responding party shall name an arbitrator within fifteen (15) days of receiving the above notification. Within twenty (20) days of the appointment of the second arbitrator, the two arbitrators shall select a third arbitrator to act as chairman of the tribunal. If either party fails to appoint an arbitrator within the allotted time or the two party-appointed, neutral arbitrators fail to appoint a third arbitrator as provided above, the AAA shall appoint the arbitrator(s). Any vacancies will be filled in accordance with the above procedure. The parties expressly agree to the consolidation of separate arbitral proceedings for the resolution in a single proceeding of all disputes that arise from the same factual situation, and the parties further expressly agree that any issue of arbitrability or the existence, validity, and scope of the agreement to arbitrate shall be decided by the arbitrators. The parties further agree that either party may apply to a court of competent jurisdiction, pending arbitration, for injunctive relief to preserve the status quo, to preserve assets, or to protect documents from loss or destruction, and such application will not be deemed inconsistent with or operate as a waiver of the party's right to arbitration. The arbitrators shall apply as the substantive law to the dispute the laws of Ontario, as specified in section 6.1 of this Agreement.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement in one or more counterparts, which counterparts shall constitute one integrated agreement, by their duly authorized officers effective as of the day first above written.

VECTOR PIPELINE LIMITED PARTNERSHIP
By VECTOR PIPELINE LIMITED
As General Partner
(Transporter)

_____ By: _____
Date

Title: _____

(Shipper)

_____ By: _____
Date

Title: _____

Exhibit A
To
Operational Variance Service Agreement No. _____
Under Toll Schedule OVS
Between
Vector Pipeline Limited Partnership and _____

Primary Term:	_____
Daily Variance Quantity (DVQ):	_____GJ/day
Hourly Variance Quantity (HVQ):	_____GJ/hour
Primary Receipt Point:	_____
Primary Delivery Point:	_____
Toll Election (maximum or negotiated):	_____
Associated FT-H Agreement:	_____

APPENDIX 13

Annual cost of transportation from the Dawn Hub

Annual Capacity Factor	**20%**	**50%**
Annualized capital cost of GEPP Natural Gas Utilization System after Vector Tap until exit of meter station	$58,730	$58,730
GEPP O&M	$10,000	$10,000
Vector Pipeline FT-H	$381,185	$381,185
Vector OVS	$200,000	$200,000
Vector Pipeline fuel	$0	$0
Total annual cost	$649,915	$649,915

APPENDIX 14

Environmental Screening and Review Report

Green Electron Power Project

Oil Springs Line, St. Clair Township, Ontario

ENVIRONMENTAL SCREENING

AND

REVIEW REPORT

November 5, 2012

Prepared by: Hubert S. Vogt P.Eng.

Reviewed by: Bruce E. Holbein Ph.D.

Approved by: Hubert S. Vogt P.Eng

Overview of this Environmental Review Report 5
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Overview of this Environmental Review Report

This Environmental Screening and Review Report (ESRR) provides environmental screening and review pursuant to Ontario regulation 116/01 for the Green Electron Project proposed for St. Clair Township in Lambton County, Ontario. The project is for one approximately 300 MW natural gas fueled combined cycle electricity generation facility to be built on only one of two sites on Oil Springs Line near Greenfield Road, one referred to in this ESRR as the East Site and the other as the West Site. After thoroughly evaluating both candidate sites the proponent will proceed to develop only the one site having the most favourable cost and risk potential. Both sites are shown in Figure 1.

The proponent for the Green Electron Power Project is Greenfield South Power Corporation, and this ESRR has been prepared for the proponent by Eastern Power Limited, an affiliate of the proponent having long term experience with electricity generating projects in Ontario.

This ESRR is structured to provide full screening and review for each site pending final site selection by the proponent. To facilitate this, the report is divided into two separate, complete, stand-alone divisions with Division A pertaining to the East Site and Division B pertaining to the West Site.

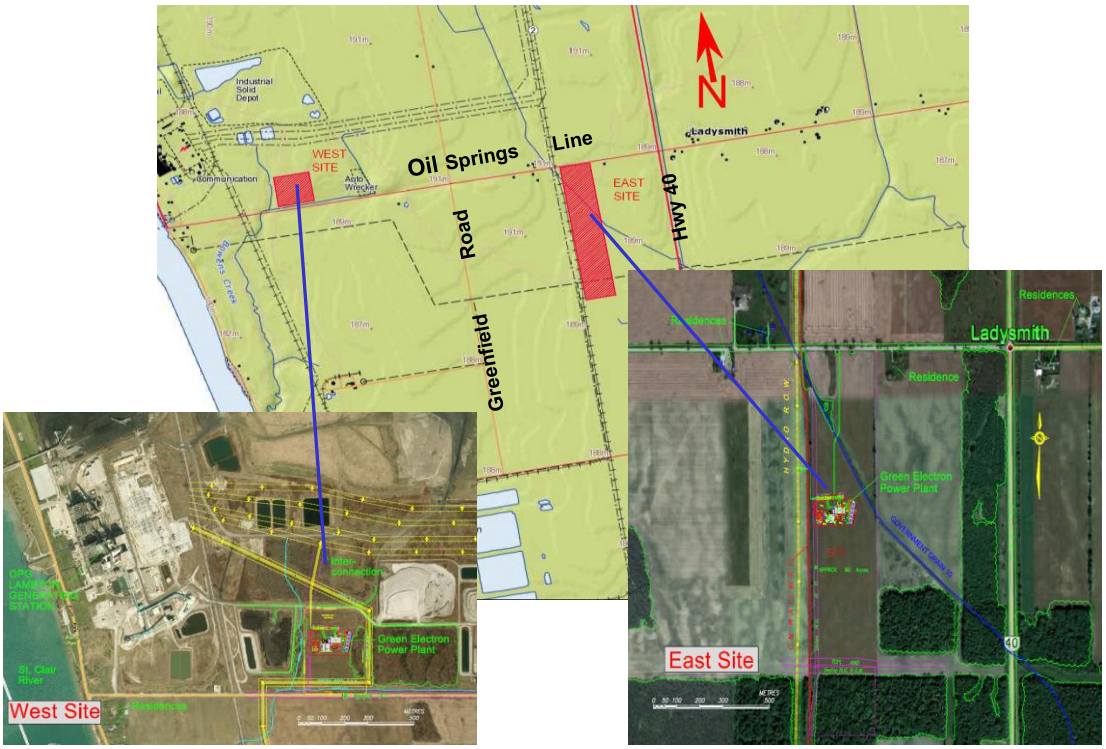


Figure 1. Green Electron Power Project Location

A. East Project Site

1. Executive Summary

Division A of this Environmental Screening and Review Report (ESRR) assesses the potential environmental impacts and provides appropriate mitigation measures for the Green Electron Power Project, should it be situated on the East Project Site, i.e. on the south side of Oil Springs Line approximately 900 m east of Greenfield Road, St. Clair Township, County of Lambton, Province of Ontario, Canada. This ESRR has been prepared in accordance with the requirements of Ontario Regulation 116/01. This project is for a new natural gas-fuelled electrical generation facility of approximately 300 MW on the East Project Site as shown in Figure 1. The proponent is Greenfield South Power Corporation.

An environmental screening and consultation with affected agencies and concerned citizens, was utilized to identify impacts or potential impacts associated with the project in all its life cycle phases of construction, commissioning, operation and decommissioning. This involved direct discussions with agencies and reviews of environmental studies of similar projects.

During the screening process some potential impacts were identified as requiring further assessment, particularly related to combustion emissions to the atmosphere and noise emissions. Consequently, the proponent chose to proceed directly to the environmental review stage and has now completed studies of air emissions, noise and other potential environmental impacts. These studies were instrumental in identifying impacts and effective mitigation strategies for these impacts, so as to ensure that there would be no net negative effects from the project.

The proponent has publicized and held two open houses (August 16 and Sept 12, 2012) to meet and receive comments from any interested local residents or concerned individuals.

With appropriate mitigation measures being implemented, the Green Electron Power Project situated on the East Project Site will not have negative environmental effects. On the basis that this project replaces coal-fired generation in Ontario, the Green Electron Power Project can be concluded to have an overall positive environmental impact.

2 Introduction

2.1 Green Electron Power Project

The Green Electron Power Project involves the construction and operation of a new, clean, natural gas fuelled, electricity generating plant which will facilitate the replacement of coal-fired power generation in Ontario. Under the contract with the Ontario Power Authority, the operating pattern of the power plant will likely be primarily during “shoulder” and “peak” electricity demand periods. The peak and shoulder demand periods occur typically between morning and evening on summer and winter business

days. Current projections therefore indicate that the plant will likely run about 25% of the available hours in a given year. The plant will be able to start-up and reach full load status within 3 hours of request.

The project proponent is Greenfield South Power Corporation and this report has been prepared on its behalf by Eastern Power Limited. Eastern Power has been involved in the design, construction and operation of electrical power generating plants in Ontario since 1988 and Eastern Power Limited is licensed as an electricity generator by the Ontario Energy Board.

The East Project Site is located in St. Clair Township on the south side of Oil Springs Line approximately 0.6 km west of Highway 40 and 0.9 km east of Greenfield Road (see Fig. 2.1 - Site Map). This site is on vacant, industrially zoned land where electricity generation is permitted and in an area that is designated for heavy industrial uses. The site has been used for agricultural purposes for many years and is presently under cultivation. The East Site is located immediately east of Hydro One's 230 kV transmission corridor for circuits L28C and L29C. All of the plant's electrical output is to be delivered to the existing transmission circuit L28C. In addition, natural gas supply services are located at or near by the site

Figure 2.1 - Site Map/Layout for East Site, Green Electron Power Project

The project may have a net, combined generation capacity of approximately 330 MW depending on prevailing weather conditions, manufacturers' design margins, equipment condition, etc. and the facility will include a gas turbogenerator set and a steam turbogenerator set configured as a combined cycle power plant to be fueled entirely with natural gas. Final configuration and/or sizing of key plant equipment may require adjustment during the engineering and procurement phases of the project; however the completed plant will meet all of the performance obligations to the Ontario Power Authority. Any such engineering optimizations would be expected to not materially affect the scope or the conclusions of this Environmental Screening and Review since appropriate "worst case" parameters and assumptions have been used in evaluating the environmental impact of the project.

2.2 Environmental Screening and Review of Green Electron Power Project

This report assesses the environmental impact of the Green Electron Power Project and is being conducted in compliance with Ontario Regulation 116/01 under the Environmental Assessment Act. The project falls under Category B in the most recent (2011) guidelines for O.Reg. 116/01 and therefore requires the project to go through the screening process defined in the guide so as to ensure acceptable overall environmental impact as per the criteria set out in the guide.

The notice of "Commencement of Screening" was first published in the Sarnia Observer on July 30, July 31 and August 1, 2012 and the Wallaceburg Courier on August 9, 2012 (see Appendix 17.7, Public Consultation Report). Screening included initial consultation with the Ministry of Environment and key affected agencies including St. Clair Township, Lambton County and the St. Clair Region Conservation Authority (SRCA). This was followed by additional consultation with key government and public agencies. A presentation of the project was made to the full Council for St. Clair Township by the proponent on August 13, 2102 at which time various council members asked questions as to the nature of the project. Local citizens and elected representatives were invited to two open houses for the project on August 16, 2012 and September 12, 2012. Details of the public consultation and government/agency review processes together with comments and inputs as obtained are included in Appendices 17.7 and 17.8, respectively.

The proponent identified some impacts of the project during the screening process (see Appendix 17.1, Screening Criteria Results) that required further assessment, namely air and noise emissions. The proponent therefore decided to proceed directly to the environmental review stage without first issuing a finalized screening report. The further review and assessment included separate studies of air emissions, noise emissions and other environmental impact studies that were completed (see Appendix 17.2, Air Quality Impact Study; Appendix 17.3, Acoustical Assessment Report; Appendix 17.4, Existing Ecology and Impact Study: Appendix 17.5, Stormwater Management Study and Appendix 17.6, Archaeological Assessment). The public and various affected public agencies were notified of the commencement of the review stage as per the MOE guideline and all input was incorporated into this ESRR report (see Appendices 17.7 and 17.8).

The results of the initial environmental screening (Regulation 116/01 checklist) can be found in Appendix 17.1. This screening checklist reflects an indication of potential environmental impact of the project at any phase in its life cycle, but prior to applying any mitigation measures. The 'Additional Information' section of the checklist provides direct reference to the appropriate section in this report and to supporting documentation (appended materials), thereby allowing ready review of the impact, the choice of appropriate mitigation strategy and the net impact after mitigation. Net impacts are also summarized in the 'Additional Information' section of the checklist, with these reflecting the overall net impact once the appropriate mitigation measure has been implemented.

3. Project Description

3.1 Project Location

The Green Electron Power Project, should the East Project Site be chosen, will be located in St. Clair Township on the south side of Oil Springs Line about 0.9 km east of Greenfield Road and 0.6km west of Highway 40 on about 2 hectares of a 36.5 hectare property that is designated for heavy industrial uses under the St. Clair Township's Official Plan and Zoning By-law. The site is currently used as rental crop land. The site is located immediately east of Hydro One's 230 kV transmission corridor for circuit L28C, via which the plant's output is to be delivered to the existing transmission grid.

Natural gas is to be supplied from one of the existing supply lines either running through the site itself or nearby to the site.

Water for process cooling will be supplied from the Lambton Area Water Supply System (LAWSS) via the existing 24" line on Greenfield Road and/or by a new lateral line from CF Industries Courtright Nitrogen Complex located about 3 km to the southwest of the East Site.

Cooling process wastewater will either be discharged for treatment into the municipal wastewater treatment facility in Courtright or be treated on the project site and discharged to the environment under an Environmental Compliance Approval to be issued by the Ministry of the Environment. Treated discharge water will be discharged by one of two routes: by a discharge line to CF Industries where it will be discharged into an existing discharge canal to the St. Clair River or through a new proponent provided outfall to the St. Clair River. The option for a new outfall is regarded only as a potential future option. Both the options for treatment of the wastewater at the Courtright Sewage Treatment Plant and treatment of the wastewater on site with treated water discharge to the canal at CF Industries are both potentially viable based on the projected quantity and quality of the wastewater and both options are subject to additional ongoing commercial and approval considerations with the respective municipal and industrial service providers.

3.2 Description of Project Facilities

The power plant design is based on the well established and successful technology used for natural gas combined cycle power generation throughout the world. A simplified flow diagram of the process for the power plant is shown below as Figure 3.1. The thermodynamic efficiency of the plant will be about 48% which is much higher than for coal fired facilities or simple cycle natural gas facilities.

Gas Turbine Generator Set:

The power plant will utilize one GE 7FA gas turbine generator set fuelled by natural gas. The gas turbine driven generator will be rated nominally at 217 MVA. Dry low NO_x burner technology has been selected to reduce NO_x emissions production. With dry low NO_x burner technology, the use of selective catalytic reduction (SCR) technology is not required or recommended because it can lead to other particulate emissions. Dry low NO_x technology also avoids hazards related to ammonia handling that would be necessary with SCR utilization. Additionally, SCR technology is best suited to non peaking facilities that are in regular operation as SCR technology is designed to operate efficiently only under continuous operation.

Heat Recovery Steam Generator:

The power plant design is based on the use of a water-tube, heat recovery steam generator (HRSG) equipped with a supplementary natural gas duct burner. The HRSG will be shop-constructed and site assembled. The HRSG will be rated to deliver all of the steam required by the steam turbine generator.

The steam generating system will include an economizer, multiple pressure cycles (high pressure, intermediate pressure and low pressure steam re-heaters), pressure relief valves as well as other "trim" valves and piping.

Steam Turbine Generator Set:

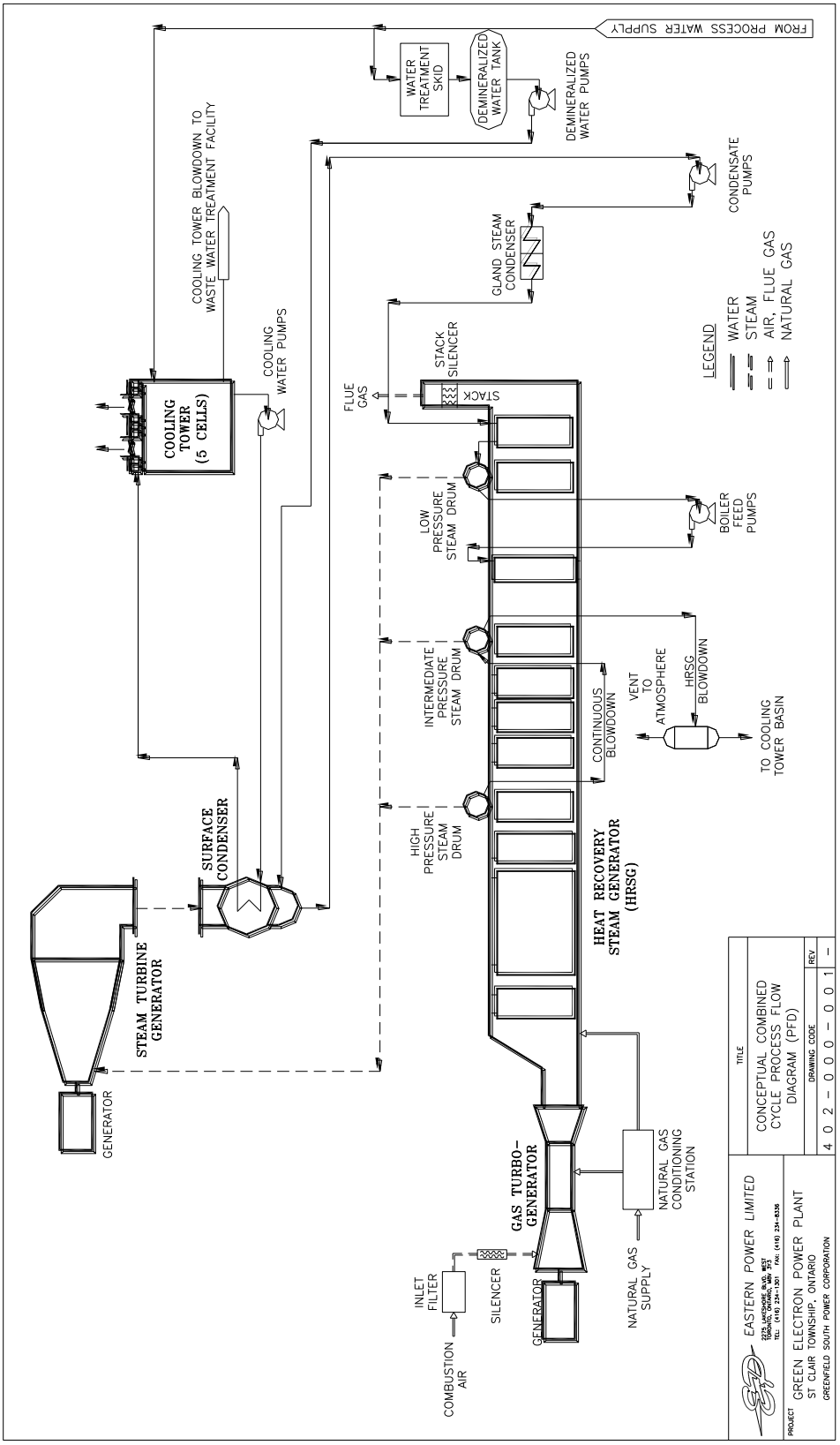
The power plant will utilize one Fuji steam turbine generator set. The unit is "packaged" with all accessories so as to reduce site installation time. The steam turbine driven generator will have a nominal rating of 158 MVA.

Condenser and Boiler Feed Water Systems:

The condenser will be a shell and tube unit. The condenser will be designed to maintain the backpressure required by the full load on the steam turbine. A wet surface versus a dry condenser design was selected on the basis of lower noise emissions with the wet design, i.e. reduced requirement for air volume and associated noise-emitting blower fans. The condenser is expected to evaporate up to approximately 100 litres/second of water when it is operating, with up to approximately 20 litres/second released as blow-down wastewater for treatment and discharge. Since the highest expected daily duty of the plant is about 12 hours, the daily average make up from the municipal water supply is expected to be around 50 litres/second.

The boiler make-up water treatment system will use reverse osmosis, softener, and electronic deionizer units to upgrade city water to the needed high purity. The closed-loop condensate and boiler feed-water system will consist of a condensate hot well, a holding ejector, boiler feed pumps and condensate return pumps. The use of advanced electro-deionizer regeneration technology largely eliminates the need for sulphuric acid and caustic soda chemical feeds.

Figure 3.1. Simplified Process Flowsheet Diagram of Green Electron Power Facility



Electrical System:

The electricity will be generated at 18kV by the combustion turbine generator and at 13.8kV by the steam turbine generator. This power will flow through generator step up transformers to feed the power plant's internal loads (via the tertiary winding of the steam turbine generator step up transformer) and then the remainder will be exported to the Hydro One transmission system at 230 kV via the facility's high voltage switchyard .

The high voltage substation will include hot-dip galvanized steel terminal structures with circuit breakers , disconnect switches, bus, bus supports, lightning arrestors, connectors, cables, trays, etc., as well as the main output transformers. The substation will be located adjacent to the generating plant and will be enclosed by a barbed-wire fence.

The main output transformers will be oil-filled and rated at about 250MVA and 200MVA respectively with two stages of fan cooling. The transformers will be equipped with a no-load tap changer, as well as temperature, pressure and oil level instrumentation.

Switchgear line-ups will include electrically operated generator circuit breakers and medium and low voltage circuit breakers and fused disconnects to isolate the medium voltage and low voltage switchgear and motor control centres. Current transformers and potential transformers for metering and protection will also be mounted in the switchgear. Cables or bus bars meeting the electrical safety codes will be used to connect the generators, switchgear, and transformers.

A construction phase service and back-up power source connection for the plant will be provided from the existing adjacent electricity distribution system of Hydro One Networks Inc.

A relaying and metering panel will be provided to house the relaying and protection equipment, which will meet the requirements of Hydro One and the IESO, including high speed, high band width communication capability, if necessary. The medium voltage station service transformers will be of a dry-type and will be located indoors. Low Voltage Switchgear will be provided on the secondary side of the unit auxiliary transformers to feed power to the motor control centres.

Civil Works:

The plant building will be a braced steel structure enclosed with pre-finished metal siding. The roof will consist of a metal roof and/or built-up membrane roofing. The operating floor and mezzanine floors will be of reinforced concrete construction, and the other platforms and walkways will be of steel grating. The steam turbine bay will be served by an electrically-operated, overhead crane. Windows and louvers will be provided as required for appearance and function. Acoustical and/or weather enclosures will be provided where required. The building design includes advanced acoustical suppression design features including turbine enclosures within buildings along with noise suppression building insulation and muffling/silencing features, as were initially designed for urban setting requirements and is thus well suited to meet rural noise suppression needs for the East site.

The area surrounding the plant will be graded to facilitate proper drainage of rainwater. Asphalt pavement will be provided for primary walkways, driveways, and staff parking lot. Gravel paving will be used for secondary areas. Landscaped areas will consist of seeding of grass and planting of trees and shrubbery to meet the municipality's site plan approval requirements. A chain link fence will be provided around the plant area and electrical substation. Portions of the balance of the property will be left undisturbed in the case of the woodlot and other portions may be utilized as out-leased agricultural cropland.

The developed area for the facility on the overall East site is shown in Figure 2.1. This area represents less than 10% of the entire site area. Importantly, the existing woodland area at the south end of the East site will not be developed. Stormwater flows on all non-developed areas of the site will not be collected and existing natural flows will be retained as per pre-existing conditions. Stormwater collected from covered surfaces will be routed to the basin of the facility cooling system for use/treatment. Thus, the stormwater management system as related to covered surface collection will not be subject to a separate MOE compliance approval permit for discharge, i.e., as affected stormwater requiring collection and potential treatment will be covered as part of the MOE sewage discharge permit (see below).

Water Supply and Wastewater discharge:

Building supply water will be from the municipal supply line running along Oil Springs Line. Water for process cooling will be supplied by lateral lines from either the existing large diameter municipal line on Greenfield Road to the west or from CF Industries to the south/west.

Domestic sewage (toilets. showers) from the facility will be connected to an on-site septic treatment system or combined with industrial wastewater for conveyance should the latter be routed for treatment in the Courtright Sewage Treatment Plant (see below).

Process wastewater will either be discharged for treatment into the municipal wastewater treatment facility in Courtright or be treated on the project site and discharged to the environment under an MOE Environmental Compliance Approval. Treated discharge water from the site will be discharged by a discharge line to CF Industries where it will be discharged into an existing outfall discharge canal to the St. Clair River.

Instrumentation and Controls:

The plant control system will be designed so that the plant can be operated fully from the control room, where the status of all systems can be monitored.

Electrical and Natural Gas Interconnection:

The plant will be electrically interconnected with the 230 kV circuit L28C of Hydro One immediately west of the East site as shown in Figure 2.1 and for back-up power it will also be interconnected with the distribution circuits of Hydro One Networks Inc. The

plant will receive natural gas from one or more of Union Gas Limited, TransCanada Pipelines Limited or Vector Pipeline Limited Partnership with connection either directly on the East site or via a lateral connection to nearby pipelines located south of Oil Springs Line. The approximate connection routes for natural gas supply and electrical power output delivery are shown in Figure 3.2.

3.3 Site Layout Constraints

The project property comprises approximately 36.5 hectares. The location of the plant on the property has been optimized to include several important considerations, including the lay-down and staging areas required during construction (2 hectares), access drives, set-backs, distances to the nearest residential points of impingement and reception for emissions and noise, visual site lines, and maintaining the ecological function of the natural areas in the vicinity. Consultations with the St. Clair Township and the St. Clair Region Conservation Authority (SCRCA) resulted in a further optimization of the site plan (see Figure 3.2 for the revised plan). Minor set-back variances as were required for the site layout on the East Project Site were approved on August 27, 2012 by St. Clair Township.

The conceptual layout of the plant is shown in Figure 3.2. This layout with services interconnections may be adjusted as the design is finalized and site plan approval is obtained. Any such adjustments will not negatively affect the conclusions of this Environmental Screening and Review Report.

Figure 3.2 - Preliminary Project Layout and Interconnection

3.4 Project Life Cycle Phases

The key phases of the project and relative timing for these are shown in Table 3.1.

Table 3.1 Green Electron Power Project Phases

Project Phase	Activity Description	Estimated Duration	Comment
Construction	grading, excavation, building erection, equipment installation	21 months	Typical industrial construction methods; Construction laydown areas to be landscaped (trees/grass) at end of construction
Commissioning	testing and first operation of equipment	3 months	frequent start and stops and episodic noise from line cleanings etc
Operation	operation and maintenance of equipment	25 years	Peaking operation mode expected
Decommissioning	removal of equipment	-	Plant and equipment is potentially recyclable

4. Surface and Ground Water Impacts

4.1 Surface Water

Most of the East Project Site lies within the St. Clair Region Conservation Authority (SCRCA) fill regulation zone primarily along Government Drain No. 10. There will be no physical alterations made to the routing of this drainage ditch. The existing crossing with culvert as shown in Figure 3.2 will be upgraded to provide additional width and load-bearing capacity as needed. The elevation grade level of the facility will be raised approximately 1m, i.e., to a similar elevation as that existing at Oil Springs Line. The SCRCA has been consulted as to fill permit requirements.

The facility may consume water supplied by Lambton Area Water Supply or by CF Industries, each of which sources their water from the St. Clair River. The quantity to be used by the facility is well below 19 million liters per day and thus no notification under the Great Lakes Charter will be required.

Should industrial wastewater be routed to the sewage collection and treatment facility in Courtright, Green Electron facility domestic sewage will be combined with this industrial discharge for conveyance and treatment at the Courtright Sewage Treatment Plant. This will have no negative impacts to surface or groundwater on or off the East site and will not require a MOE discharge permit.

Should treated industrial wastewater be treated at the facility and routed to the drainage canal at CF Industries this discharge will be subject to an MOE approval. For this CF Industries canal discharge option, the potential residual contaminants in the treated wastewater primarily result from evaporative concentration of essentially pre-existing river water dissolved solids. These have been reviewed, as has the assimilative capacity on the canal receiver and the St. Clair River with a defined mixing zone. This review has shown that the process waste water flow comprises less than 0.0004% of the flow of the St Clair River and thus is well within the assimilative capacity of the receiver within a reasonable mixing zone. It is understood that treatment/discharge at CF Industries canal would require MOE compliance approval. GSPC recognizes that for this approval an application for this would be made detailing the treatment process train and treated water quality in relation to establishing approval conditions. An application for such approval would follow this ESRR.

Storm water from the site currently recharges groundwater through infiltration while surface excess drains directly into Government Drain No. 10. The project will result in <10% of the project property being covered with buildings or non-porous paving. Stormwater collected from impervious surfaces will be collected to the basin of the cooling basin for use while stormwater on the balance of the site will be allowed to drain as to pre-existing conditions. Details of the storm water management plan can be found in Appendix 17.5.

The stormwater control methods used by the project will be in accordance with the Ministry of the Environment's "Stormwater Management Planning and Design Manual" (MOE, 2003). Collected stormwater will be utilized for cooling such that any discharge of

this would be within the industrial wastewater discharge stream. Thus, stormwater management in relation to that stormwater collected from covered surfaces will not require a separate MOE stormwater discharge permit. Stormwater from the large non-developed/non-disturbed portion (90% area) of the site will remain routed as to pre-existing natural conditions.

Given the various provisions above, the project will not have net negative impacts on surface waters.

4.2 Ground Water

There is no plan for any taking of groundwater by the project.

Neither the construction nor operation of the plant is expected to result in the release of any substances that will impact ground water. The built-upon, plus non-porous paved footprint of the project will be about 2 hectares. Thus with landscaped areas across the balance of the project property there will not be significant impact on groundwater recharge.

Therefore, the project will not have negative impacts to ground water.

4.3 Sedimentation and Soil, Shoreline or Riverbank Erosion

Prudent measures in accordance with the MOE/MNR “Guidelines on Erosion and Sediment Control for Urban Construction Sites” and the MOE Guidelines for “Evaluating Construction Activities Impacting Water Resources” will be taken to prevent sedimentation and/or erosion of soil during construction, including appropriate run-off control, grading and paving practices, and the use of geo-fabrics. These measures will be detailed in an erosion control plan to be completed prior to the commencement of construction. The overall site will be landscaped so that open areas will not be subject to erosion. Stormwater drainage works for the project will be engineered to prevent significant sedimentation or erosion of soil. Details on stormwater management can be found in Appendix 17.5. All site works will conform to the regulatory requirements of the St. Clair Region Conservation Authority in terms of fill placement as well as prevention of sedimentation or erosion.

With the above measures, the project will not have negative impacts related to soil erosion.

4.4 Accidental Spills

The project will use a variety of liquids during construction and operation. Some liquids will be used in such small quantities so as not to pose a significant risk of environmental impact. An example of this is the use of small amounts of incidental cleaning solvents such as varsol. Other liquids will be used in larger quantities but will be stored indoors in suitable storage tanks that will be designed to prevent accidental spills, (e.g. turbine lubricating oil tank and sodium hypochlorite tank) or in the case of the main output

transformers will each be equipped with a concrete spill containment structure and the risk of environmental damage due to spills will therefore be virtually eliminated.

Risks of ammonia release to the environment from spillage, fugitive gaseous release or from emissions of by-product ammonium compounds have been avoided through the adoption of dry low NOx mitigation technology instead of selective catalytic reduction (SCR). SCR use would have required substantial ammonia transport and use on the site (see section 6.1 for additional details).

To ensure expeditious response to any spill, a spill response contingency plan will be developed and followed. The plan will include prompt notification of any spills to the Ministry of the Environment Spills Action Centre and municipal authorities as required, specific mitigation measures for various possible scenarios, protocols for maintenance of spill response supplies and equipment, and training for operating staff on spill response procedures.

The above measures will ensure the project will not have net negative impacts arising from accidental spills.

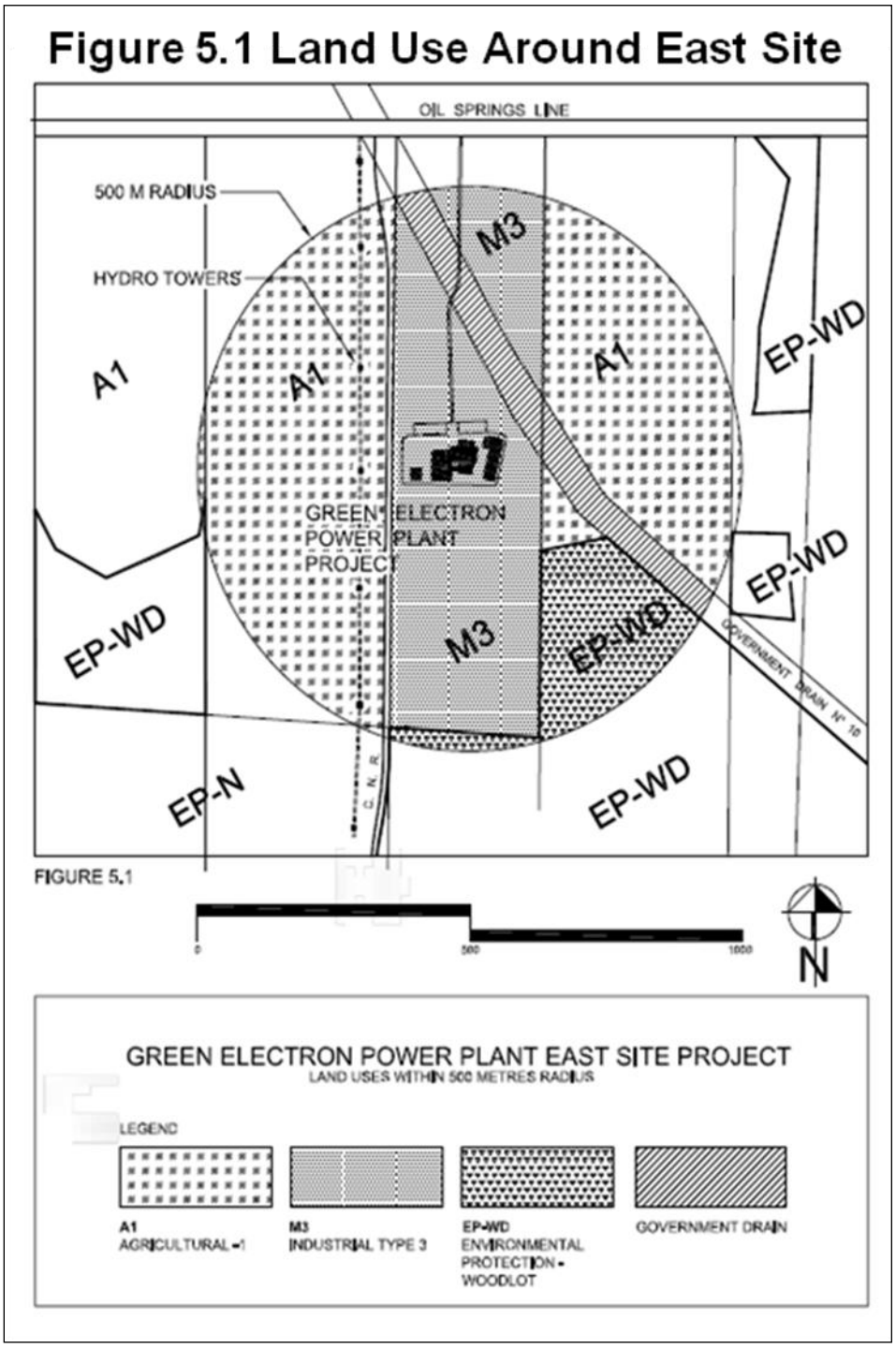
5. Land Use Impacts

5.1 Residential, Commercial and Institutional Land Uses within 500 metres

Figure 5.1 shows the current land uses near the East project site and especially within the 500 metres zone as prescribed in the MOE screening guidelines. None of the area within a 500 metre radius zone around the project currently has designated residential land uses or zoning. Approximately 30% currently has industrial zoning (almost all of which is currently used for agriculture) and 52% currently has agricultural land uses and zoning. There are no institutional or commercial land uses within 500 metres of the project.

All of the agriculturally zoned lands located within 500 m of the project site are already designated for heavy industrial use by the existing official plan of St. Clair Township, reflecting the expectation that these lands would all eventually be used for heavy industrial activities. In fact, in November 2006 Shell Oil proposed a large scale, 1000 Ha, bitumen-based oil refinery that included these lands, but in July 2008 it shelved this project.

Most of the land uses within the 500 metres radius zone of the project are zoned for agricultural and industrial uses (37.9%). There are also infrastructure uses including electrical transmission corridors, a single railway track, as well as roads such as Oil Springs Line (18.4%). Green-space and open-space totals [27.1%] in area within the 500 m zone.



Compatibility of the facility with residential and commercial land uses within the prescribed 500 meter zone was achieved through design and mitigation features, specifically implemented to minimize the key impact factors including; noise, odour, dust, vibration, aesthetics and operational intensity. The impact of the facility on surrounding land uses was also evaluated against the criteria set out in MOE Guideline D–6, *Compatibility Between Industrial Facilities and Sensitive Land Uses*.

The project's operating noise impacts with mitigation measures will meet the stringent MOE rural nighttime criteria in the provincial and municipal noise regulations (see Section 6.4 and Appendix 17.3 for details). The plant's net mitigated noise level at any sensitive receptor will not be audible above local background noise during the day time on non-holiday weekdays, which is when the plant is primarily expected to operate so as to meet the peak and shoulder demand for electricity. Therefore the project's noise impacts are characteristic of a Class II industrial facility under MOE Guideline D–6.

The project's odour and dust emissions impacts are detailed in Section 6.3 and are expected to be infrequent and not intense. For comparison purposes, Class II industrial facilities under the MOE Guideline D–6 include even those with frequent and occasionally intense odour and/or dust emissions.

The plant's primary rotating equipment will be highly balanced and will not cause any ground-borne vibration that would be perceived off-property. Class II industrial facilities under MOE Guideline D–6 include those with possible ground-borne vibrations that are not perceived off property.

The height and massing of the project's buildings and structures achieves a massing that is acceptable given the zoning and set-backs. The building height and stack height will also be in character with surrounding industrial and high voltage transmission corridor uses as is detailed in Section 9.1.

The project will not include outside processing or outside storage of raw materials, finished products or waste materials. Class II industrial facilities under MOE Guideline D–6 permit outside storage and open processing.

The plant will result in visible water vapour plumes from its stack and condenser circuit during colder weather, the impact of which is detailed in Section 6.1 and Appendix 17.2. Given that the plant is expected to operating only during periods of peak and shoulder demand for electricity and that the water vapour plumes will not be visible in warmer weather, the project will have only periodic outputs of minor annoyance that are characteristic of a Class II industrial facility under MOE Guideline D–6.

The project's operational intensity will be a function of the timing, quantity and characteristics of personnel and vehicle movements due to plant staffing, plant deliveries and plant shipping. The personnel and vehicle movements due to the project are detailed in Section 10.7. Vehicle movements due to the project will occur predominantly during the daytime on non-holiday weekdays, and will typically only use Oil Springs Line and Highway 40 (an existing 4 lane highway). These impacts are characteristic of a Class II industrial facility under MOE Guideline D–6, which allows for shift operations and frequent movement of heavy trucks primarily during daytime hours.

Based on the application of all of the criteria set out in MOE Guideline D–6, the facility is a Class II Industrial Facility by virtue of its medium scale, the periodic outputs of minor annoyance (i.e. vapour plume visibility only during colder weekday hours and noise occasionally audible off property) and truck movements during daytime hours only.

MOE Guideline D–6 indicates that a Class II industrial facility is expected to have a zone of potential influence of 300 m and recommends a minimum of 70 m separation from sensitive land uses. The Green Electron Power Project facility sources of emissions will

be at least 400m from the closest sensitive land use, which is therefore greater than the minimum separation distance recommended in MOE Guideline D–6.

Therefore, through appropriate design and East site layout features and through the incorporation of the mitigation measures as described above, the project will have no net negative impact on the residential and commercial land uses within 500 metres of the project. The project will also meet the separation distance from sensitive land uses as recommended in MOE Guideline D-6.

5.2 Consistency with Provincial Policies or Objectives

The project is consistent with the March 1, 2005 Provincial Policy Statement (PPS) issued under Section 3 of the Planning Act (Ontario Municipal Affairs and Housing, 2005). This PPS promotes optimum use of existing infrastructure, and preservation of employment areas. These policy objectives will be met, as the project is to be located so as to provide optimum use of the existing infrastructure for high voltage electricity transmission and high pressure natural gas supply. The PPS also promotes the protection and wise use of the natural environment, water, agriculture, minerals, petroleum, aggregates and cultural resources. Sections 7, 8, 9 and 10 of this report describe how the project is consistent with these policies. The PPS further directs development away from natural or human-made hazards, and the project will not be located in any area of known flooding, erosion, or human-made hazards.

Additionally, the project is consistent with the Places to Grow Act in that the project would make efficient use of existing infrastructure (water, sewage, electrical transmission, and natural gas pipeline), that the project would use an employment area for employment use, and that the project is located within an area designated for growth.

The project is therefore in-line with the policies and objectives of the Places to Grow Act and other provincial policies or objectives aimed at improving the quality of life in Ontario.

5.3 Consistency with Municipal Land Use Plans, Policies and By-Laws

The site is currently zoned for manufacturing (M3) by St. Clair Township and designated for employment uses in its official plan and that of Lambton County.

St. Clair Township has confirmed that the power plant use would be permitted on the site as currently zoned, and that no amendment to the official plan or zoning bylaw will be needed. Only minor variances as to setbacks were required and these were publicized, uncontested and accepted by the St. Clair Township Committee of Adjustment on August 27, 2012. The project will therefore have no net impact due to any lack of consistency with existing land use plans, policies and by-laws.

5.4 Impact on Hazardous, Unstable or Contaminated Lands

The project will not utilize or result in any hazardous unstable or contaminated lands.

The project site has been found to be free of environmental hazards through an independent environmental site assessment (ESA Phase I study/report; LVM Sept 14, 2012). This ESA, completed in accordance with CSA 768/01, found there to be no potential for contamination from one closed waste site in the vicinity and only low potential for contamination due to a lack of information about the quality of fill associated with the nearby rail line, and thus it concluded, "Based on the findings of this investigation, it is our opinion that no further assessment of the subject site is warranted."

Therefore, the project will not be affected by nor have negative impacts related to the use of hazardous, unstable or contaminated lands.

6. Air and Noise Emissions

6.1 Air Quality Impacts

The Green Electron Project facility will combust natural gas as its only fuel resulting in relatively few and well described emissions to the atmosphere, i.e., primarily NO_x, CO, CO_2 and PM but virtually no SO_x (traces only from mercaptan safety tracer additive in natural gas) or heavy metal emissions that accompany coal combustion.

The facility will utilize dry low NO_x burner technology, which minimizes NO_x production during combustion. By employing dry low NO_x burners, the Green Electron facility will avoid the need for selective catalytic reduction (SCR) technology and thus avoid SCR co-product emissions, consisting of particulates of various ammonium compounds. Environment Canada recommends dry low NOx technology for gas turbine applications and has indicated that SCR technology is not recommended in association with dry low NOx burner technology for such natural gas turbine applications (Klein, 2005).

Therefore, the facility will also avoid potential SCR-related releases of fugitive ammonia and associated particulates to the atmosphere (slippage) and potential accidental releases of ammonia to the environment (i.e. a potential liquid ammonia spills and health/safety issue is also avoided, see Section 4.4 for further details).

Additionally, there will be no mercury or other heavy metal emissions, as pipeline quality natural gas carries essentially no mercury or other heavy metals, both of which have been of concern with coal-fired facilities (US DOE, 1996, NREL, 2000 and MOE, 2001).

As a result of NO_x mitigation, the Green Electron facility will emit reduced quantities of NO_x, low amounts of CO, low amounts of particulates and reduced levels of CO_2 (a greenhouse gas, see Section 6.3 for further discussion).

The emissions from the facility to the atmosphere have been assessed in an East site-specific study of air quality impacts using the latest MOE approved USA EPA AERMOD dispersion modelling tools with site-specific topographical and meteorological information and as reported fully in the Air Quality Impact Study (Appendix 17.2). This MOE ESDM-compliant analysis has indicated low concentrations of contaminants at all relevant Points of Impingement (POI) as summarized in Table 6.1. Maximum POIs were below 6.55% of the maximum allowable MOE POI concentrations for all potential

contaminants. The emissions shown in Table 6.1 have been modeled under the worst case emission scenarios to account for the variation in output due to seasonal variations and design margins. At start up of the facility, a yellow plume may be visible for a relatively brief interval of time which is expected and normal for this type of facility. In this regard, it is important to note that all startup emissions that are briefly higher are included in the air emission assessments with the worst case emissions of startup followed by full load as provided in the report and as shown in Table 6.1.

Table 6.1 - Emission Summary Table (Maximum Emission Scenario - Startup followed by Full Load); from report in Appendix 17.2

Contaminant Name	Contaminant CAS Number	Total Facility Emission Rate [g/s]	Air Dispersion Model Used	Max. POI Concentration [µg/m^3]	Averaging Period	MOE POI Limit [µg/m^3]	Percentage of MOE POI limit
NOx	10102-44-0	12.0 / 7.0	AERMOD	24.64 / 5.75	1 hr / 24 hr	400 / 200	6.2% / 2.9%
CO	630-08-0	18.2	AERMOD	45.38	0.5 hr	6000	0.8%
SOx	9/5/7446	0.11	AERMOD	0.23	1 hr	690	0.03%
PM	NA	0.74	AERMOD	0.49	24 hr	120	0.5%

Table 6.2 further summarizes the principal facility emissions rates and provides comparisons relative to those from Ontario's coal-fired facilities (MOE, 2005). Thus, the project's emission rate for NO_x will be only 9.1% of that which would occur from a typical Ontario coal-fired facility producing the same amount of electricity, while SO_x emissions from the project will only be 0.035% of that which would occur with coal.

Table 6.2 Emissions Summary for Green Electron in Comparison to Coal

Emission	Green Electron Project		Average Coal Facility [c]	Green Electron Power Project Emission Rates as % of Coal Specific Emission Rates
	Emission Rate per Unit of Electrical Energy kg/MWh	Annual Emission [a] kT	Emission Rate per Unit of Electrical Energy kg/MWh	
NO_x	0.128	0.094	1.41	9.1 %
SO_x	0.00137	0.00090	3.9	0.035%
CO_2	263	173	880	19.7%
Mercury	0.0	0.0	0.000017	0.0%

a. Annual Green Electron facility emissions are based on operation for 25% of yearly hours.
c data from MOE, 2001

The annual total Green Electron emissions are also shown in Table 6.2, based on the currently estimated 25% of available yearly operating hours.

In terms of particulate emissions, these will be negligible through utilization of Dry Low NOx technology rather than SCR technology, and especially as compared to coal-fired facilities. Environment Canada has indicated that the particulate levels from such gas facilities (with dry low NO_x and no SCR) are near zero (Klein, 2005).

The US DOE (2000) has completed Life Cycle Analyses (LCA) to provide a complete comparison of natural gas to coal fired power facilities (NREL, 2000). A LCA includes net power plant emissions as well as those from mining the fuel resources and from transporting these to power facilities etc, and thus, the LCA provides a global benefit analysis. The overall life cycle reductions of emissions through utilizing natural gas instead of coal can be seen in Table 6.3.

Table 6.3 GreenElectron Life Cycle Analysis Emissions Reduction versus Coal Facility[a]

Emission	Reduction Natural Gas Versus Coal
NO_x	78%
SO_x	95%
Particulates	99%
Mercury	100%
CO_2	52%

[a] from NREL, 2000

It can be appreciated through comparing the results of Tables 6.2 and 6.3 that, while overall LCA analyses show large improvements from using natural gas, actual emissions at the power plant are very small for natural gas versus coal. In other words, the local environmental benefits (specific power facility emission reductions) of using natural gas versus coal are substantially higher than are the global (LCA) benefits.

Therefore, air quality in the local and regional air sheds can be expected improve as a result of the Green Electron Power Project because it enables the phase out and displacement of corresponding coal fired electricity generation emissions. The Green Electron Power Project will result in cleaner air for all Ontarians, especially those living downwind of the Lambton coal-fired plant in St Clair Township and Lambton County.

The facility will emit water vapour emissions from its stack and the wet cooling condenser, which will be visible (as fog vapour) under certain conditions of ambient air temperature and relative humidity. These emissions, while non-toxic, have potential for causing off-property visibility problems. On the basis of the plant location, stack and cooling tower heights and their location relative to the facility, the distances to potential points of off-property impingement, as well as prevailing wind conditions, etc, it has been estimated that these water vapour emissions will not cause off-property impacts related to visibility (see section 8.4 of report in Appendix 17.2 for further details).

Therefore, on the basis of all of the above findings and with mitigation measures in place, there will be no net negative impacts from the Green Electron Power Project due to air pollutant emissions to the atmosphere.

6.2 Cumulative Impact Assessment of Air Emissions

Cumulative impact assessments for air quality have been made using the latest Environment Canada Guidelines (Environment Canada, 1999). The analysis of the Green Electron facility's contribution and cumulative impact to the local and regional airshed quality, based on its specific emissions (summarized in section 6.1 above) have been assessed. For this cumulative impact assessment, actual historical and prevailing MOE collected air quality data as measured over the last five years at the air monitoring station closest to the East site were utilized as the pre-existing ambient condition to then assess the cumulative impacts resulting from the addition of the Green Electron Power Plant emissions. Studies of the current ambient air quality in the vicinity of the proposed facility, together with an analysis for the project's emissions, have indicated that the project's emissions will have only minor influence on the air shed's ambient air quality for nitrogen dioxide and even less for other contaminant emissions shown in section 6.1 and the report in Appendix 17.2. This cumulative impact analysis has revealed that any measurable increases to air contaminant concentrations above actual pre-existing ambient levels (i.e., that include all other relevant existing sources) will be slight, primarily only for NO_X, will be highly localized in effect and all within the existing normal variability of the current ambient air quality parameters. These findings are reported in Appendix 17.2 and are consistent with the findings of others for similar facilities (also reviewed and discussed in Appendix 17.2).

On the basis of this cumulative impact analysis, together with the associated phase out of coal burning electrical power plants, the Green Electron facility will not contribute significantly to smog in either the local or regional air sheds.

Therefore, on the basis of the above findings and with mitigation measures in place, there will be no net cumulative negative emission impacts from the Green Electron Power Project due to air pollutant emissions. On the basis that the Green Electron Power Project displaces coal emissions it can be concluded that the project will positively impact cumulative impacts through an actual lowering of total emissions and an improvement in local and regional air quality.

The Green Electron project will require MOE-issued Environment Compliance Approval under Section 9 of the Environmental Protection Act, in relation to the air emissions as detailed in this report (as well as for noise emissions reported in section 6.5), prior to construction and operation of the facility. In accordance with Ontario Regulation 379/01, the Green Electron site facility will have an emissions monitoring program in place that may include predictive/parametric emissions monitoring, continuous emissions monitoring, stack sampling and/or fuel analysis.

6.3 Greenhouse Gas Emissions

Table 6.2 (above) summarizes the CO_2 emission rate while Table 6.3 (above) summarizes the CO_2 emission reduction assuming coal is the baseline case for comparison. GHG reductions are accounted on an LCA basis and in reference to a baseline case. Therefore, there will be no net negative impacts from the project in relation to greenhouse gas emissions and in terms of replacing coal there will be a net

decrease in greenhouse gas emissions. The Green Electron Power Project therefore provides offsetting GHG reductions and no net negative impacts.

6.4 Dust or Odour Emissions

The project will not emit any significant amounts of dust or odour. During construction, potential dust emissions will be mitigated by good construction practice and dust suppression techniques. During operation there will be no material emissions of dust. Neither the construction nor the operation of the project will result in the emission of any significant odours. Minor and transient emissions of odour due to asphalt paving during the construction phase are not considered as significant. Therefore, there will be no net negative impacts related to dust or odour from the project.

6.5 Noise Impacts

The facility includes a number of noise sources, which in combination may not be allowed to exceed acceptable levels at critical receptors. The project will achieve this through a variety of strategies including use of a wet surface air cooled condenser rather than a dry air cooled condenser, use of inlet and exhaust silencers on the gas turbine, acoustic insulation, sound barriers and optimized plant layout. The pre-existing on-site acoustical environment was measured for the East site and consequently the MOE exclusionary nighttime limit of 40dBA (L_{EQ}) was applied for assessment. The significant potential sound sources of project facility and all buildings near the project have been acoustically modeled in three dimensions taking into account the levels and qualities of noise emitted from all sources (see acoustical report in Appendix 17.3).

Appropriate mitigation measures as described in appendix 17.3 have been identified and will be applied to ensure the facility noise emissions are at or below the MOE criteria for all significant off-site receptors during daytime and nighttime facility operation. Noise emissions are subject to MOE review and issuance of compliance approvals prior to project construction and operation.

Therefore, with the above-referenced mitigation measures employed noise emissions from the project will meet MOE limits and will have no net negative impacts.

7. Human Health

The Green Electron Power Project is replacing an equivalent portion of Ontario's coal-fired electrical generation and therefore will lessen overall health impacts from power generation in Ontario. Consistent with this statement, the Ontario Public Health Association has reported that the move from coal fueled to natural gas fueled generation will lessen health impacts in Ontario (OPHA, 1999).

Quantitatively, the substantial reduced health impacts resulting from replacing coal fueled power generation have been reviewed (MOE, 2005). This MOE study estimated that the phase out of all of the coal fired electricity generating stations in Ontario will prevent 660 premature deaths annually, prevent 920 hospital admissions annually,

prevent 1,090 emergency room visits annually and prevent 331,000 minor illness cases annually. The Ontario Public Health Association (OPHA, 1999) in resolution 1999-01, called for the conversion of Ontario's coal-fired facilities to natural gas-fired facilities, such as the facility represented by the Green Electron Power Project, i.e., a move to improve air quality and public health impacts.

The net health benefits from lower emissions with conversion from coal to natural gas power generation are now well established through a number of earlier health and environmental impact studies. Natural gas is a relatively clean fuel source and free of a number of emissions that occur with coal, such as mercury and sulphur. In addition, nitrogen oxide emissions are much lower from natural gas.

Previous studies have concluded that incremental quantities of additional emissions from natural gas facilities will not be measureable within the natural variations of the background ambient air quality. Consistent with these earlier findings, an incremental cumulative impact assessment for the Green Electron Power Project has found that the project will not contribute to any exceedances over the pre-existing ambient air quality (see Appendix 17.2). The analyses show that for all operating scenarios and environmental conditions, including conditions conducive to producing worst-case contaminant concentrations, the Green Electron project's contaminant concentrations will be below the prescribed maximum limits detailed in Ontario Regulation 419/05. The project will also not contribute to any exceedances of the Ambient Air Quality Criteria (AAQC) even on those occasional upset days of poor background ambient air quality.

It can be therefore be concluded that based on East site specific emission modelling and established health science affects, the Green Electron Power project will not have significant negative human health impacts.

Moreover, because the project is replacing coal-fired generation capacity, the Green Electron Power project will provide a net contribution to overall improved air quality and consequently to improved human health.

8. Existing Natural Environment and Impacts

The existing natural environment has been assessed through a site specific Ecological and Environmental Impact study as provided in Appendix 17.4. The proposed project East site lies within an area of agricultural (leased) land use in spite of its industrial zoning. The major portion of the East site is presently open agricultural field and was planted with wheat in 2012 and has now been harvested. Soya bean fields border the wheat field to the north, east and west. Based on the Ecological Classification System for southern Ontario (ELC; Lee et al., 1998), the agricultural field does not fall into any known ecosystem type. Based on more recent, but unofficial ELC classifications for southern Ontario, the agricultural field is classified as open annual row crop. The woodland area on the south of the East site located approximately 500 m south of the facility footprint connects to the Clay Creek Woodland ANSI. The ANSI area lying within the boundaries of the property is not planned for development and is composed of Swamp Maple Mineral Deciduous Swamp Type (SWD 3-3) and Dry - Fresh Oak – Hickory Deciduous Forest Type (FOD2-2). As the Project footprint will be well beyond 120 m of the ANSI, a species inventory was not undertaken.

Based on field investigations conducted on September 10, 2012 and a review of available background information, the overall environmental effects of the Project with respect to the terrestrial and aquatic components are expected to be minimal with the proper implementation of typically employed mitigation measures.

8.1 Rare, Threatened or Endangered Species

There were no rare, threatened or endangered species of plants or animals presently found on the East site as based on field observations in September 2012 and as reported in the ecological and environmental impact Study (Appendix 17.4).

Based on the site habit and off-site reports it has been determined that three Species At Risk (SAR), i.e., the Butler's Garter Snake, the Eastern Fox Snake and the Blanding's Turtle could potentially be found present in the overall Project study area but the presence of this or any other potential SAR within the area to be developed is moderate for Butler's Garter Snake and Eastern Fox Snake and low for the Blanding's Turtle. Nonetheless, consideration and precautions to ensure the safety of these potentially occurring SAR should be taken during construction and later operational phases of the project, i.e. if these (or any other) SAR is actually found during project construction or later.

Given that the project will affect only less than 10% of the entire East site area and site alterations to the existing natural environment will not be made to undeveloped site areas, especially the woodlot area at the south of site, any risk to any potential SAR or to the Clay Creek ANSI (see 8.2 below) is minimal and adequately mitigated in proactive project design.

Therefore, the project will not have negative impact on rare, threatened or endangered species of flora or fauna.

8.2 Protected Natural Areas (ANSI or ESA)

The woodland area on the south of the East site located approximately 500 m south of the facility footprint connects to the Clay Creek Woodland ANSI. The portion of the ANSI area lying within the boundaries of the property is not planned for development and because the project footprint will be well beyond 120 m of the ANSI, a species inventory was not undertaken.

The St. Clair Township Official Plan designates all mature wooded lands as "natural area", and this would include the southern portion of the East site of about 10 ha. This wooded area will remain undeveloped and undisturbed.

Given the above mitigation measures, the project will have no impacts on protected, sensitive or scientifically significant natural areas.

8.3 Wetlands

There are no Provincially significant or protected wetlands on the East site. The woodlot to the south of the property does have minor wetland features that connect to the wooded ANSI corridor system south and west of the East site. There are significant

wetland and water features in this ANSI. MNR's Land Information Ontario (LIO) database Provincially Significant Wetland (PSW) layer indicates that the Clay Creek Woodland ANSI is also part of the Bickford Oak Woods (BOW) Wetland Complex.

Given the wooded areas of the East site will not be developed; the project will have no significant net impact on wetlands.

8.4 Wildlife Habitat, Population, Corridors or Movement

The woodland area on the south of the property is likely part of a wildlife movement corridor given its connection to adjacent areas to the south and west. Thus, this area will not be developed. The balance of the East site given its open field multi-year agricultural use would not be a significant wildlife habitat or corridor.

During the planning and construction phases of the project, appropriate measures as in accordance with Ministry of the Environment "Guidelines for Evaluating Construction Activities Impacting on Water Resources" (MOE, 1995) will be implemented so as to minimize ecological disturbances to Government Drain #10 and its downstream connections.

These will include measures required to prevent erosion and sedimentation as detailed in Section 4.3 of this report, measures to minimize mud tracking onto adjacent municipal roads, measures to re-use fill materials wherever possible, and measures to protect any mature trees wherever possible.

Therefore, given the above mitigation methods, the project will have no net negative impacts on wildlife habitat, population, corridors or movement.

8.5 Fish Habitats

Site reconnaissance of Government Drain #10 within the sections transecting the East Site indicated a permanent feature with intermittent / ephemeral reaches in drought conditions. Site reconnaissance confirmed the designation of Government Drain #10 as a Type C Drain under the DFO drain classification system. This section of the creek is likely to freeze to bottom in the winter therefore providing no overwintering habitat for fish. Project construction and operation will not affect fish or fish habitat following proper mitigation measures for erosion and sedimentation as described in section 8.4.

Should treated wastewater discharge be via pipeline to the existing drainage canal at CF Industries there will likely be no negative impacts to fish habitats given that similar acceptable power plant blowdown wastewater is already being discharged at that location and the high volumes of .higher quality cooling water that flow through this discharge canal from CF Industries. Should this option be selected this will be confirmed.

During the planning and construction phase of the project, appropriate measures will be implemented to prevent any erosion or sedimentation which could significantly impact Government Drain #10. Section 4.3 of this report provides further details on prevention of erosion and sedimentation. Appendix 17.4 provides mitigation measures to be taken during construction to limit any potential downstream affects on fish habitats.

Given the above mitigation measures and the confirmatory steps to be taken depending on which option for wastewater discharge is selected, the project will have no significant impacts on fish habitats.

8.6 Migratory Birds

The project site is not known to be part of the critical habitat or staging area for any migratory birds.

Therefore, the project will have no net impacts on migratory birds.

8.7 Locally Important or Valued Ecosystems or Vegetation

The bulk of the project site and the entirety of the area to be developed is not part of any locally important or valued ecosystem, nor is there any locally important or valued vegetation on the site, as the original ecology of the project site has been disturbed by agriculture since the 1800s. The wooded area at the south of the East site and outside the project footprint area to be developed does have a valued ecosystem being part of a connected ANSI (see section 8.2 above).

Ecologically relevant emissions from the facility will be primarily nitrogen dioxide and carbon monoxide which will be fully dispersed to the atmosphere from a 43 m high stack. The total absence of mercury emissions and the very low annual sulphur dioxide emissions indicate that ecological impacts from terrestrial deposition of contaminants (mercury or acidic rain) at or in the areas surrounding the site will be very small and acceptably low.

Given the above mitigation measures, the project will have no net impacts to locally important ecosystems or vegetation.

9. Natural Resources and Potential Impacts

9.1 Efficient use of Non-renewable Resources

The Green Electron Power Project will have an electrical generation efficiency of approximately 48%, and will therefore be one of the most efficient electricity plants in Ontario. The MOE (Ontario Regulation 116/01) defines efficiencies of over 40% as being an “efficient use of non-renewable resources”. The facility will utilize natural gas which is fossil-sourced and non-renewable. However at 48% efficiency, the project will meet the MOE guideline criteria in terms of efficient use on non-renewable resources.

The connection of the facility to the immediately adjacent electrical transmission lines also minimizes potential electrical line losses in the electrical distribution system for this new electrical generation capacity. This aspect also enhances efficient use on non-renewable resources.

Although future higher energy efficiency is technically possible via cogeneration with by-product hot water usage by nearby institutions or industries, this is not currently feasible,

as the facility is expected to only operate during periods of peak and intermediate peak demand for electricity. The future feasibility of adding a cogeneration component could be re-evaluated at a future date, i.e., should the operating basis of the facility change so as to enable this option and depending on the arrival of local industrial energy users in for example the neighbouring industrial lands.

Therefore, the project will minimize its impact on the use of non-renewable resources by using the cleanest currently available non-renewable fuel source resource and in a more efficient manner than for most fossil fueled electrical generation facilities.

9.2 Agricultural Lands

The project site is zoned for industrial uses and therefore, the project will have no impacts to the use of agriculturally zoned lands.

9.3 Existing Agricultural Production

The project site, although zoned for industrial uses, is currently used for agricultural crop production. Undeveloped open areas of the East Project Site (about 90% of the property) after the start of routine operations may be utilized for compatible agricultural purposes.

9.4 Mineral, Aggregate or Petroleum Resources

There are no known mineral or petroleum resources on the site and therefore, the project will have no material impacts on mineral, aggregate or petroleum resources.

9.5 Forest Resources

There are no merchantable forest resources on the site, and therefore the project will have no material impacts on forestry resources.

9.6 Fish and Game Resources

There are no fish or significant game resources on or nearby the East site. However, there are fish resources in Clay Creek that is connected to Government Drain #10 south of the site and fish resources downstream of Clay Creek in the St. Clair River. Section 8.5 above described mitigation measures to ensure no impacts to off-site fish resources.

Therefore, with the above mitigation measures, the project will have no net impacts on either fish or game resources.

10. Socio-Economic Impacts

10.1 Neighbourhood or Community Character

The Green Electron Power Project is within St. Clair Township that already hosts several similar electricity generating facilities as well as petrochemical and related heavy

industrial facilities. Thus, the facility is in keeping with the general character of the overall community. Closer to the East Site itself, the neighbouring lands are zoned either industrial or agricultural with an expectation for continued industrial growth displacing present agricultural uses. Given that the plant is to be located adjacent to an existing 230,000 volt electrical transmission line and an adjacent natural gas pipeline corridor, as well as an adjacent railway line, the location is very suitable from a land use planning perspective.

The new plant will be visually compatible with the existing tall, visually significant, galvanized steel towers of the electrical transmission lines adjacent to the site and the tall OPG Lambton Generating station visible to the west. The existing 230,000 volt transmission towers just west of the site are about 25 m in height, whereas the proposed power plant stack will be 43 m high and the plant buildings and structures will be about 20 m high.

The proposed plant location will also avoid the need for the creation of new transmission corridors, and/or expansion of existing transmission corridors, and/or the construction of new transformer stations and/or expansion of existing transformer stations.

The closest schools to the East Project Site are Mooretown-Courtright Public School about 6 km to the north west and Brigden Public School about 14 km to the northeast. The closest post-secondary education facility is the Lambton College of Applied Arts and Technology about 22 km to the north in Sarnia. Given the distances to the project site, there will be no significant impact on any of these facilities.

The closest hospital to the East Project Site is the Charlotte Eleanor Englehart Hospital in Petrolia about 25 km to the northeast. There are no nursing homes, or other long-term care facilities within 500 metres of the project site.

The site is zoned for industrial activity and is designated for employment uses in official plans of both St. Clair Township and Lambton County.

Therefore, given the above, the project will have no net negative impacts on neighborhood or community character.

10.2 Local Businesses, Institutions or Public Facilities

The Green Electron Power Project will purchase about $ 10 million from local businesses during construction and contribute approximately about $ 3.8 million annually to the local economy once the plant is in operation. Given that the gross domestic product of Lambton County was about 6 billion in 2011 and that the total value of industrial construction in Lambton County in 2011 was about $ 200 million, the impact of the project on local businesses will be only incremental positive, and should cause no distortions (shortages or surpluses) in the local or regional economy.

The approximately 200 person years of construction employment created by the project will have only a minor impact on local public institutions such as schools, hospitals and public facilities. Most of the construction workers are expected to be from the local and broader area of the project and likely commute to the site, e.g. from Sarnia or Chatham for the two to three months that such a typical trades worker may be employed at the site.

The approximately 30 full time operating and maintenance jobs created by the project will have only a minor impact on local public institutions and facilities given that the population of Lambton County in 2011 was about 128,000 and is forecast to grow.

Therefore, the project will have no net impacts on local businesses, institutions or public facilities.

10.3 Recreation, Cottaging or Tourism

The Green Electron Power Project is in an industrial area, not close to and will not have any significant impact on any nearby recreation, cottaging or tourism.

Therefore, the project will have no impacts on recreation, cottaging or tourism.

10.4 Community Services or Infrastructure

The Green Electron Power Project will require domestic water supply of up to about 100 liters per second for boiler feed-water and condenser circuit make-up and result in the discharge of up to approximately 20 liters per second of cooling tower and boiler blowdown water to the environment while in operation. Lambton Area Water Supply staff and CF Industries officials have both indicated that existing water supply systems can accommodate the water supply requirements with the existing infrastructure. Additionally, St. Clair Township officials have confirmed that the Courtright Sewage Treatment Plant has capacity to receive and treat the Green Electron project wastewater.

The Green Electron Power Project is about 25 km from Chris Hadfield Airport in Sarnia and thus the maximum height of buildings and structures on the project is not limited by regulations issued under the Aeronautics Act and therefore the project will have no impact on aviation infrastructure.

The approximately 200 person years of construction employment created by the project will have only a minor impact on community services or infrastructure as most of the construction workers are expected to be from the local and broader area of the project and likely commute to the site, e.g. from Sarnia or Chatham for the two to three months that such a typical trades worker may be employed at the site.

Therefore, the project will have no net impacts on community services or infrastructure.

10.5 Economic Base of Community

The Green Electron Power project will inject approximately $3.8 million annually into the local economy over its 25 year minimum operating life in the form of salaries, procurement of local service and supplies and taxes. Economic ripple effects of up to 4X these direct economic benefits can also be expected. Given that the 2011 nominal gross domestic product of Lambton County was about $6 billion and that the total value of industrial construction in Lambton County in 2011 was about $ 200 million, the impact

of the project on local businesses will be positive and incremental, and should cause no distortions from shortages or surpluses in the economic base of the community.

St. Clair Township, Lambton County, Ontario and Canada will incrementally benefit from the economic activity flowing from the construction and operation of the project, therefore the project will have no net impacts on the economic base of the community.

10.6 Labour Supply and Employment

The Green Electron Power Project will result in about 200 person years of construction employment as well as 30 skilled, full-time jobs once the plant is in operation. Given that Lambton County had total employment of about 128,000 in 2011 and a total value of industrial construction of about $ 200 million in 2011, the impact of the project on local businesses will be positive and incremental, and should not cause any distortions through shortages or surpluses in the labour markets of Lambton County, Ontario or Canada.

Therefore, the project will have no net negative impacts on labour supply and employment.

10.7 Motor Vehicle Traffic

The Green Electron Power Project will cause only a short-term increase in local vehicle traffic during the construction period that will be noticed primarily by other users of Oil Springs Line and Highway 40. Highway 40 is a major through road serving many industrial establishments and has two lanes in each direction nearest the site with a design capacity of about 2000 vehicles per hour. Although no recent traffic count data is available, traffic has been observed through several site visits to be relatively light at all times of the day.

Construction of the Green Electron Power Project will cause a short-term addition of an estimated 400 vehicle movements per day primarily on Oil Springs Line and Highway 40 within a range between 15 and 100 peak vehicles movements per hour. Once in operation, the project will cause an addition of about 50 vehicle movements per day, within a range of between 2 and 10 peak vehicle movements per hour. The peak vehicle movements will almost exclusively occur during the daytime and on workdays. The only in operation routine vehicle movements on weekends and holidays will be approximately four passenger vehicle movements associated with each morning and evening shift changes. The existing design of Oil Springs Line and Highway 40 can readily accommodate both the short-term and long-term increase in vehicle traffic.

Therefore, the project will have no net impacts on motor vehicle traffic.

10.8 Public Health and Safety

The Green Electron Power Project will improve public health and will not have any measurable impact on public safety.

The project will improve public health in that it facilitates the phasing out of coal-fired electricity generation in the St. Clair Township air shed. The phasing out of coal-fired electricity generation will reduce the emission of mercury, particulates and other

pollutants thus resulting in a cleaner local, regional and Ontario-wide air shed, as is detailed in Section 7 above and through a recent cost benefit analysis report (MOE, 2005).

Therefore, the project will have no net impacts on public health and safety.

11. Heritage and Culture Impacts

11.1 Heritage Buildings, Structures, Sites

The Green Electron Power Project will not have any impact on any heritage buildings, structures or sites as determined through a Site Heritage/ Archaeological Assessment (Appendix 17.6). There are currently no buildings or structures of any kind on the site. The site is not of significance from a heritage perspective.

Therefore, the project will have no impacts on heritage buildings, structures or sites.

11.2 Archaeological Resources or Cultural Heritage Landscapes

The Green Electron Power Project will not have any impact on any archeological resources or cultural heritage landscapes as determined through a Site Heritage/ Archaeological Assessment (Appendix 17.6).

Therefore, the project will have no impacts on archaeological resources or heritage landscapes.

11.3 Scenic Views or Aesthetically Pleasing Landscapes

The Green Electron Power Project will not have any impact on scenic views since the site does not have, nor form part of, any scenic views. The project will not have any impact on aesthetically pleasing landscapes since the site is not a component of an aesthetically significant landscape. The proposed site is adjacent to a rail line and a 230,000 volt electrical transmission line corridor. The new plant will not further disturb the landscape at the site because of the existence of several tall, visually significant, galvanized steel towers, and the industrial facilities near to the site in the west and to the south of the site.

Therefore, the project will have no impacts on aesthetically pleasing landscapes.

12. Aboriginal Impacts

12.1 Impacts on First Nations

The East site land of the Green Electron Project site is not part of any First Nation (FN) reserve lands or on lands subject to any pending claims by aboriginal peoples communities. There are First Nation reserves in the greater region of the project site: Aamjiwnaang First Nation approximately 20 km to the north of the site; Walpole Island First Nation approximately 20 km to the south; Moravian of the Thames First Nation

approximately 47 km from the site; Chippewas of Kettle and Stony Point approximately 55 km from the site; Chippewas of the Thames First Nation approximately 79 km from the site; Munsee Delaware First Nation approximately 79 km from the site; Caldwell First Nation approximately 82 km from the site and Oneida Nation of the Thames approximately 85 km from the site

Consultation with each of these First Nations was undertaken by both letters and direct telephone calls to their respective Chiefs requesting meetings to provide further information and seeking consultation on the project and later through additional letters requesting any comments or concerns. This led to one positive response for a meeting with the Walpole Island Fist Nation and this meeting was held on the Walpole Island First Nation. Follow-up calls were later taken following lack of response to a second letter of invitation for comments or concerns for the remaining First Nations that had not responded to earlier letters or calls. Further details of the consultations with First Nations are provided in Appendix 17.8.

The project reflects appropriate stewardship of natural resources as detailed throughout this ESRR and the proponent will continue its dialogue with First Nations to ensure that the impact on First Nations is net positive to them. In this regard, the project will provide new employment opportunities for the region, including to First Nations.

13. Other Potential Impacts

13.1 Waste Materials Requiring Disposal

Waste materials created by the project include non-hazardous solid waste and non-hazardous liquid waste. During construction waste materials will be substantially similar to those that are created at the majority of industrial construction sites. Primarily these wastes consist of packaging materials, excess or spoiled construction materials, and incidental wastes (e.g. from workers meals, and job site administration). During operation the waste material will be substantially similar to those created at the majority of light industrial establishments. Primarily these wastes are incidental to the clean electricity generation process which itself creates no solid waste stream. Typical wastes will be broken or worn out equipment parts, packaging materials associated with repair parts, consumables such as air filter elements and incidental wastes (e.g. from workers meals, and plant administration). Wherever economically feasible or if mandated by law, solid waste materials will be recycled. During operation the plant will also create a small quantity of liquid wastes that require specialized disposal, including lubricating oil and cleaning spirits. Any such hazardous wastes will be handled only by MOE licensed recycling or disposal companies.

Therefore, the project will not have net negative impacts due to the generation of wastes requiring disposal off-site.

13.2 Mitigation Implementation, Monitoring and Feedback

All project staff and external contractors will be made and kept aware of their individual responsibilities for implementing the necessary mitigation and impact management measures and, their responsibilities for regularly monitoring the implementation of these

measures during all phases of the project to ensure that all mitigation measures are being applied as required and that they are performing adequately. Monitoring will also be required to identify unforeseen environmental impacts, which may require additional mitigation or impact management. Implementation of these possible additional mitigation and/or impact management measures will then be required. A project Environmental Impact Management plan has been developed and this is provided in Appendix 17.9.

13.3 Sustainability Aspects of the Project Design

The Green Electron Power Project concept and design, in addition to the features described above, includes provisions for practical inclusion of a number of sustainability criteria as summarized below:

a) Sustainable Community Design

There is a potential for future energy cogeneration from the project (as described in section 9.1, above). Should the future operations of the facility permit useful supply of cogenerated energy, the proponent would explore the potential for a nearby industrial use of this cogeneration energy with potential users.

b) Sustainable Technologies

The proponent has chosen state of the art equipment to provide the most efficient and cleanest technology practically attainable in relation to the Green Electron Power Project. The proponent is committed to bringing future innovations to the facility in relation to water conservation, emissions reduction and energy efficiency as proven and practically appropriate to the facility and its design and operational requirements.

c) Pollution Prevention

The proponent is committed to minimizing all emissions through a strong and rigorous program of plant maintenance, monitoring and operating procedures as more fully discussed in section 13.2 (above).

d) Sustainable Design

The facility buildings and its equipment will comprise recyclable and reusable materials to the extent practically possible. All waste lubricants, oils etc from operations and maintenance will be recycled through licensed off-site service suppliers.

e) Eco-efficiency Programs

The Green Electron Power Project achieves a substantial measure of eco-efficiency notwithstanding it is a power generation facility utilizing non-renewable natural gas. This is achieved through obtaining 48 % efficiency, substantially higher than the efficiency

(25-30%) of the coal-fired generation it is replacing (see section 9.1). In addition, the project achieves substantial reduction in greenhouse gas emissions (52% reduction, see section 6.2) and achieves substantial reduction in emission of atmospheric pollutants (78% to 100% reduction, see section 6.1).

14. MOE Compliance and Other Approvals

The Green Electron Power Project will require an Environmental Compliance Approval for the facility from the Ministry of the Environment in accordance with MOE regulations including those under Section 9 of the Environmental Protection Act for Air, Noise and possibly Waste Water/ Industrial Sewage, i.e. should the facility waste water be treated on site and discharged at the CF Industries canal These Environmental Compliance Approvals (Air, Noise and Waste Water) will authorize and regulate the emission of contaminants and noise into the air as well as treated wastewater discharge into the environment. These applications are separate to this ESRR and will be made separately.

The application for the Environmental Compliance Approval will require the submission of an Emissions Summary and Dispersion Modeling (ESDM) report, which meets the MOE guideline "Procedure for Preparing an Emission Summary and Dispersion Modeling Report" as well as an acoustical noise study. The report in Appendix 17.2 has been prepared according to these guidelines and to applicable MOE approvals requirements, respectively.

The SRCA has been contacted in relation to any requirement for a Ontario Regulation 97/04 permit for the placement of fill in the developed area of the East project site.

15. Conclusions

The Green Electron Power Project involves the construction and operation of a new, clean, natural gas fuelled, electricity generating plant in response to the Ontario Ministry of Energy's program for new clean energy supply, i.e., in relation to the replacement of coal-fired generation facilities.

The Green Electron Power Project, should the East Project Site be chosen, will be located in St. Clair Township on the south side of Oil Springs Line east of Greenfield Road on about 2 hectares of a 36.5 hectare agricultural property that is zoned heavy industrial under the St. Clair Township Zoning By-law. The site is located adjacent to Hydro One's 230 kV transmission corridor for circuit L28C, via which the plant's output is to be delivered to the existing transmission grid.

The proponent identified some impacts of the project that required further assessment, namely air and noise emissions and wastewater discharge and therefore chose to proceed directly to the environmental review stage without first issuing the environmental screening report. These further assessments are detailed in separate studies of air emissions, noise and other potential environmental impact studies that have been completed (Appendices 17.2, 17.3, 17.4, 17.5 and 17.6). The public and various affected public agencies were notified of the commencement of the review stage as per the guideline and all public and agency input as obtained was incorporated into this ESRR (Appendices 17.7 and 17.8).

Based on the results of the environmental screening and review of the Green Electron Power Project, the project can be constructed, operated and eventually decommissioned such that there will be no net negative effects to the environment or the community. This acceptable result will be achieved by appropriate facility design and through implementing the mitigation, impact management and ecological enhancement measures identified in this ESRR, including good power plant engineering, construction, operation and maintenance practices.

In addition to mitigating potential environmental impacts, the Green Electron Power Project offers a number of additional environmental advantages and human health benefits as compared to the coal-fired generation capacity it is replacing. The project will provide high efficiency (48%) electricity generation and provide large reductions in both specific emission rates and total annual emissions of nitrogen oxides, sulphur dioxide, greenhouse gases and mercury, as compared to a similar coal-fired electrical generation capacity.

16. References

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17. Appendices

17.1 APPENDIX 17.1 - Screening Criteria Results East Site

The Green Electron Power Project is defined as a Category B project and therefore subject to environmental screening so as to meet the Environmental Assessment requirements for new electricity generating projects (Ontario Regulation 116/01 and MOE guide PIBS 4021e, revised January 2011).

The Checklist responses provided below were based on current knowledge or preliminary investigations. If there was uncertainty as to the response to a criterion question, further studies or consultation was conducted to answer the question.

On the basis of the screening results (below) and early public consultation, the Proponent elected to self-elevate the overall environmental assessment process to an environmental review. Therefore, the screening criteria checklist is included below for reference, to indicate what additional studies were performed and to provide the relevant information and cross reference to appropriate sections in the Environmental Review Report.

Negative environmental effects were defined to include the negative effects that the project would have, or potentially could have, either directly or indirectly on the environment at any stage in the project life cycle, i.e., including all project phases of construction, commissioning, operational life and final decommissioning. Negative environmental effects were taken to include, but were not limited to the harmful alteration, disruption, destruction, or loss of:

1. natural features;
2. flora or fauna and their habitat;
3. ecological functions;
4. natural resources;
5. air or water quality, and
6. cultural or heritage resources.

Negative environmental effects were also assumed to include the displacement, impairment, conflict or interference with existing land uses, approved land use plans, businesses or economic enterprises, recreational uses or activities, cultural pursuits, social conditions or economic structure.

This Checklist as reported below does not take credit for mitigation or impact management measures, which are reported in detail in the Environmental Screening and Review Report. However, Net Effects are defined as the negative environmental effects that would remain after mitigation and impact management measures have been taken and such net effects are summarized in the Additional Information section of the Checklist.

Environmental Screening Checklist East Site

CRITERION		POTENTIAL NEGATIVE EFFECTS[1]		
1.	**Surface and Ground Water**	**Yes**	**No**	**Net effects including with Mitigation Measures Additional Information[1,2]**
1.1	Will the project have negative effects on surface water quality, quantities or flow?	√		-No water taking from Clay Creek. -Treatment of wastewater will mitigate impacts as reported in section 4
1.2	Will the project have negative effects on ground water quality, quantity or movement?		√	No withdrawal from or input to groundwater. Most stormwater will continue to recharge groundwater or watershed as detailed in Section 4.2 and in Appendix 17.5
1.3	Will the project cause significant sedimentation, soil erosion or shoreline or riverbank erosion on or off site?		√	See Section 4.3
1.4	Will the project cause potential negative effects on surface or ground water from accidental spills or releases to the environment?		√	Low potential for spills in construction, commissioning and operational phases. No net negative impacts as a result of appropriate containment and mitigation structures and procedures to be implemented; see Section 4.4 and 13.1 for details.

1: Impacts include potential impacts for all phases of Project Life: In accordance with MOE Screening criteria and guidelines; http://www.ene.gov.on.ca/envision/gp/4021e.pdf

2: Net Impacts as stated resulting from application of mitigation features and procedures as referenced

2.	Land	Yes	No	Net effects including with Mitigation Measures Additional Information[1,2]
2.1	Will the project have negative effects on residential, commercial or institutional land uses within 500 metres of the site?		√	There are no residential building receptors within the 500 metre zone for which atmospheric emissions and noise could have impacts. The majority of land use within the 500 metre zone is industrial. There are no net impacts from noise and emissions with mitigation measures in place as detailed in Sections 6.1, 6.2, 6.4 and in Appendices 17.2 and 17.3.
2.2	Will the project be inconsistent with the Provincial Policy Statement, provincial land use or resource management plans?		√	No inconsistency; see section 5.2 for details
2.3	Will the project be inconsistent with municipal land use policies, plans and zoning by-laws?		√	Land for the project is on industrial land appropriately zoned by the municipality; see Section 5.3 for details
2.4	Will the project use hazard lands or unstable lands subject to erosion?		√	Confirmed through review of MOE inventory and ESA Phase I study.
2.5	Will the project have potential negative effects related to the remediation of contaminated land?		√	Project will not impair the remediation of any contaminated lands and project does not emit contaminants to land; see Section 5.4 for details

1: Impacts include potential impacts for all phases of Project Life: In accordance with MOE Screening criteria and guidelines; http://www.ene.gov.on.ca/envision/gp/4021e.pdf

2: Net Impacts as stated resulting from application of mitigation features and procedures as referenced

3.	Air and Noise	Yes	No	Net effects including with Mitigation Measures Additional Information[1,2]
3.1	Will the project have negative effects on air quality due to emissions of nitrogen dioxide, sulphur dioxide, suspended particulates, or other pollutants?	√		Emissions of nitrogen dioxide, sulphur dioxide and particulate matter will occur from combustion of natural gas. No net impacts will occur with mitigation procedures in place. Emissions will meet provincial guidelines at nearest point of impingement. Emissions relative to coal-fired facilities will be greatly reduced. See Section 6.1 and Section 7 and Appendix 17.2 for details as to emissions and their mitigation
3.2	Will the project cause negative effects from the emission of greenhouse gases (CO_2, methane, etc.)?	√		Anthropogenic CO_2 emissions from burning fossil natural gas fuel. No Net Impacts as GHG emission will be reduced approximately 50% from those from coal fired facilities due to high efficiency (48%) electrical power production. See Section 6.3.
3.3	Will the project cause negative effects from the emission of dust or odour?	√		Potential dust emissions in construction phase only but no odour emissions at any phase. No Net Impacts with mitigation procedures in place; see report Section 6.3 and Appendix 17.2 for details.
3.4	Will the project cause negative effects from the emission of noise?	√		Turbines, transformers and cooling system will emit noise. No net Impacts due to noise mitigation features incorporated, resulting from noise emissions/mitigation study; see Section 6.4 and Appendix 17.3. Noise emissions at nearest critical point of reception will meet nighttime regulatory limit of 40dBA.

1: Impacts include potential impacts for all phases of Project Life: In accordance with MOE Screening criteria and guidelines; http://www.ene.gov.on.ca/envision/gp/4021e.pdf

2: Net Impacts as stated resulting from application of mitigation features and procedures as referenced

4.	Natural Environment	Yes	No	Net effects including with Mitigation Measures Additional Information[1,2]
4.1	Will the project cause negative effects on rare, threatened or endangered species of flora or fauna or their habitat?		√	Confirmed through Environmental Site Impact Study; see Section 7.1 and Appendix 17.4
4.2	Will the project cause negative effects on protected natural areas such as ANSI's (Area of natural or Scientific Interest), ESA's (Environmentally Significant Area) or other significant natural areas?		√	Confirmed through Environmental Site Impact Study; see Section 7.2 and Appendix 17.4
4.3	Will the project cause negative effects on wetlands?		√	Confirmed through Environmental Site Impact Study; see Section 7.3 and Appendix 17.4
4.4	Will the project have negative effects on wildlife habitat, populations, corridors or movement?		√	Confirmed through Environmental Site Impact Study; see Section 7.4 and Appendix 17.4
4.5	Will the project have negative effects on fish or their habitat, spawning, movement or environmental conditions (e.g., water temperature, turbidity, etc.)?		√	Confirmed through Environmental Site Impact Study; see section 7.5 and Appendix 17.4
4.6	Will the project have negative effects on migratory birds, including effects on their habitat or staging areas?		√	Confirmed through Environmental Site Impact Study; see Section 7.6 and Appendix 17.4
4.7	Will the project have negative effects on locally important or valued ecosystems or vegetation?		√	Confirmed through Environmental Site Impact Study; see Section 7.7 and Appendix 17.4

1: Impacts include potential impacts for all phases of Project Life: In accordance with MOE Screening criteria and guidelines; http://www.ene.gov.on.ca/envision/gp/4021e.pdf

2: Net Impacts as stated resulting from application of mitigation features and procedures as referenced

5.	Resources	Yes	No	Net effects including with Mitigation Measures Additional Information[1,2]
5.1	Will the project result in inefficient (below 40%) use of a non-renewable resource (efficiency is defined as the ratio of output energy to input energy, where output energy includes electricity produced plus useful heat captured)?		√	Project will achieve 48% efficiency (electrical) through combined cycle operation without provision for potential combined residual heat product use; see report Section 3.2 for details. Project ties directly to existing local transmission network improving net efficiency by avoiding electrical line losses.
5.2	Will the project have negative effects on the use of Canada Land Inventory Class 1, 2 or 3, specialty crop or locally significant agricultural lands?		√	Project lands are zoned industrial.
5.3	Will the project have negative effects on existing agricultural production?		√	Project lands have been used for agricultural production in spite of industrial zoning and are presently used for agriculture but removal is minor.
5.4	Will the project have negative effects on the availability of mineral, aggregate or petroleum resources?		√	No resource at or near facility.
5.5	Will the project have negative effects on the availability of forest resources?		√	No forest resource at or near facility
5.6	Will the project have negative effects on game and fishery resources, including negative effects caused by creating access to previously inaccessible areas?		√	No game resource at or near facility.

1: Impacts include potential impacts for all phases of Project Life: In accordance with MOE Screening criteria and guidelines; http://www.ene.gov.on.ca/envision/gp/4021e.pdf

2: Net Impacts as stated resulting from application of mitigation features and procedures as referenced

6.	Socio-economic	Yes	No	Net effects including with Mitigation Measures Additional Information[1,2]
6.1	Will the project have negative effects on neighbourhood or community character?		√	Project is consistent with activities of industrial neighbours and offsets local energy supply lost through closure of coal-fired facilities; see Section 10.1 for details
6.2	Will the project have negative effects on local businesses, institutions or public facilities?		√	Project will provide local economic stimulus and help assure energy supply security; see Section 10.2 for details
6.3	Will the project have negative effects on recreation, cottaging or tourism?		√	No applicable uses near facility.
6.4	Will the project have negative effects related to increases in the demands on community services and infrastructure?		√	Requirements for water and wastewater services have been confirmed to be within existing municipal capacities; see Section 10.4 for details
6.5	Will the project have negative affects on the economic base of a municipality or community?		√	Project will provide industrial tax revenues, economic activity and jobs.
6.6	Will the project have negative affects on local employment and labour?		√	Project will provide local employment opportunities in all phases
6.7	Will the project have negative effects related to traffic?		√	Municipality does not require traffic study due to light volumes expected
6.8	Will the project cause pubic concerns related to public health and safety?		√	No storage of natural gas; environmental emissions from natural gas are low relative to coal emissions improving public health aspects over coal facility; see Section 10.8 for details

1: Impacts include potential impacts for all phases of Project Life: In accordance with MOE Screening criteria and guidelines; http://www.ene.gov.on.ca/envision/gp/4021e.pdf

2: Net Impacts as stated resulting from application of mitigation features and procedures as referenced

7.	Heritage and Culture	Yes	No	Net effects including with Mitigation Measures Additional Information[1,2]
7.1	Will the project have negative effects on heritage buildings, structures or sites, archaeological resources, or cultural heritage landscapes?		√	Confirmed through Archaeological Assessment; see Report Section 11 and Appendix 17.6
7.2	Will the project have negative effects on scenic or aesthetically pleasing landscapes or views?		√	No scenic or aesthetically pleasing landscapes or views within view of the project.
8.	**Aboriginal**	**Yes**	**No**	**Net effects including with Mitigation Measures Additional Information[1,2]**
8.1	Will the project cause negative effects on First Nations or other Aboriginal Communities?		√	Not on First Nation (FN) land or claimed by any FN and will not affect traditional uses by FNs
9.	**Other**	**Yes**	**No**	**Net effects including with Mitigation Measures Additional Information[1,2]**
9.1	Will the project result in negative effects due to the creation of waste materials requiring disposal?	√		Cooling tower blowdown waste water contains hardness and other ions and waste heat; this impact will be mitigated by treatment in a municipal WWTF or treatment on site to MOE regulatory limits for discharge to the environment with no net affects (see Section 4.1 for details). Waste lubricants and oils will be recycled through authorized disposal/recycling service providers; see Section 13.1 for details
9.2	Will the project cause any other negative environmental effect not covered by the criteria outlined above?		√	NA

1: Impacts include potential impacts for all phases of Project Life: In accordance with MOE Screening criteria and guidelines; http://www.ene.gov.on.ca/envision/gp/4021e.pdf

2: Net Impacts as stated resulting from application of mitigation features and procedures as referenced

17.2 APPENDIX 17.2 - Air Quality Impact Study East Site and Cooling Tower Icing Study East Site

Air Quality Impact Study

Green Electron Power Project (East Site)

Township of St. Clair, Ontario

Date: October 23, 2012

Submitted by: Eastern Power Limited

Prepared by: Francis C. Itliong, P.Eng.

Reviewed by: Bruce E. Holbien, Ph.D.

Approved by: Hubert S. Vogt, P.Eng.

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References

Executive Summary

This report assesses the air quality impact of the Green Electron Power Project (East Site). This detailed study is being conducted as part of an Environmental Review in relation to the Ontario Ministry of the Environment's (MOE) requirements for environmental assessment of electricity projects, as set out in the Ontario Regulation 116/01, under the Environmental Assessment Act. The project will be located in the Township of St. Clair , Ontario, Canada. Studies, analyses and reporting with respect to the Ontario Regulation 419/05 Air Pollution - Local Air Quality the Ontario Ministry of Environment Ambient Air Quality Criteria are contained herein.

The Green Electron Power Project will have a nominal capacity of about 300 MW and will consist of one gas turbogenerator set (rated nominally at 217 MVA) and one steam turbogenerator set (rated nominally at 158 MVA) configured as a combined cycle power plant to be fueled with natural gas. The gas turbogenerator will be equipped with state of the art dry low NOx burner technology.

Five years of air quality data from one air monitoring stations located in the vicinity of the proposed power plant were collected from the Ontario Ministry of the Environment and the Sarnia-Lambton Environmental Association (SLEA) to provide baseline conditions of the existing ambient air quality. These data were used to assess the impact of emissions from the Green Electron Power Project on the local air shed. A number of air impact studies pertaining to similar combined–cycle, natural gas fueled electricity generating projects in the Sarnia Area were also reviewed so as to permit comparison of methodologies and results with this study, and to enable extension of relevant findings and conclusions from these MOE-accepted studies to the Green Electron Power Project.

For the purpose of the present analyses, the USA EPA's AERMOD modeling program was used for air dispersion modeling of the emissions from the facility. The main contaminants that will be emitted when using natural gas are oxides of nitrogen and carbon monoxide. Other contaminants that are much less prevalent include sulphur dioxide, PM10/PM2.5, trace amounts of volatile organic compounds (VOCs) and trace amounts of polycyclic aromatic hydrocarbons (PAHs). Greenhouse gas emissions include primarily carbon dioxide, with small amounts of unburned hydrocarbons (mainly methane) and nitrous oxide. All emission estimates were based on guaranteed emission factors furnished by the gas turbogenerator and the duct burner manufacturers, and also on the published US EPA Emission Factors for this type of equipment. With regard to particulate emissions and owing to the lack of meaningful source reference data, it was assumed for conservative purposes that all particulates would be emitted exclusively as PM2.5. Two gas turbine operating scenarios, full load operation and start-up followed by full load operation, were considered in the analysis to establish representative worst-case air emission conditions.

The analyses show that for all operating scenarios and environmental conditions, including conditions conducive to producing worst-case contaminant concentrations, the project's contaminant concentrations will be below the prescribed maximum limits detailed in Ontario Regulation 419/05. The project will also not contribute to any exceedances of the Ambient Air Quality Criteria even on those occasional upset days of poor background ambient air quality.

The analyses also show that the proposed power plant will meet the MOE Guideline A-5 for limits of oxides for nitrogen, carbon monoxide, and sulphur dioxide emissions. Moreover, emissions of greenhouse gases are reduced significantly as compared to coal burning electrical power plants. Studies of the current ambient air quality in the vicinity of the proposed facility, together with an analysis for the project's emissions, have indicated that the project's emissions will have only minor influence on the air shed's ambient air quality for nitrogen dioxide and even less for other contaminant emissions. On this basis, together with the associated phase out of coal burning electrical power plants, the Green Electron facility will not contribute significantly to smog in either the local or regional air sheds.

The project will require an MOE-issued Environment Compliance Approval under Section 9 of the Environmental Protection Act, in relation to the air emissions as detailed in this report, as well as for noise emissions (reported elsewhere), prior to construction and operation of the facility. In accordance with Ontario Regulation 379/01, the Green Electron east site facility will have an emissions monitoring program in place that may include predictive/parametric emissions monitoring, continuous emissions monitoring, stack sampling and/or fuel analysis.

1 Introduction

This report assesses the air quality impact of the Green Electron Power Project, should it be built on the East Site, in accordance with the Ministry of the Environment's requirements for environmental assessment of electricity projects as set out in the Ontario Regulation 116/01, under the Environmental Assessment Act. A separate corresponding report has been prepared should the project be built on the West Site.

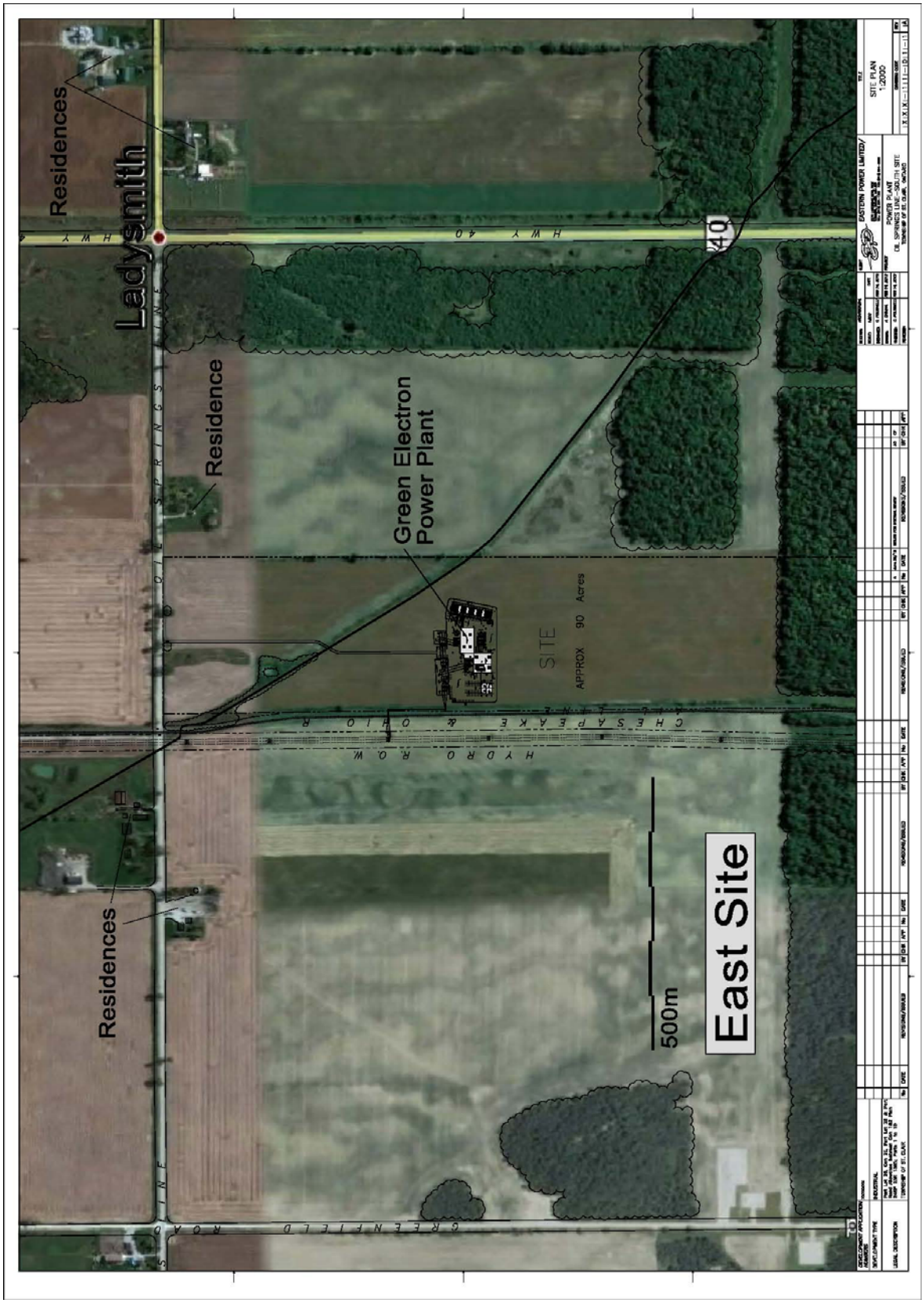
The proponent is Greenfield South Power Corporation and this report has been prepared on its behalf by Eastern Power Limited. Eastern Power has been involved in the design, construction and operation of electrical power generating plants in Ontario since 1988 and Eastern Power Limited is licensed as an electricity generator by the Ontario Energy Board.

The project involves the construction and operation of a new, clean electricity generating plant that was proposed in response to the Request for Proposals document issued by the Ontario Ministry of Energy for new clean energy supply in 2004. Under the contract that has been entered with the Ontario Power Authority, the operating pattern of the power plant is likely to be such that it will operate primarily during "shoulder" and "peak" electricity demand periods. The peak and shoulder demand periods occur typically between morning and evening on summer and winter business days. Projections suggest that the plant will likely run about 25% of the hours in a year. The plant will be able to start-up within 3 hours and go from no-load to full-load in 20 minutes.

The Green Electron Power Project will have a nominal capacity of about 300 MW and consists of one gas turbogenerator set (217 MVA) and one steam turbogenerator set (158 MVA), configured as a combined cycle power plant to be fueled with natural gas.

The Green Electron Power Project, should the East Site be selected, will be located in The St. Clair Township (see Fig 1: Site Map) on industrially zoned land that is currently used for agriculture. The site is located immediately east and adjacent to Hydro One's 230 kV transmission corridor for circuit L28C. The facility is scheduled to be in-service by mid 2014.

Figure 1 - Site Map



1.1 Project Description

The Green Electron East Site Power Project will be located in the Township of St. Clair on 2 hectares of land that is zoned for heavy industrial uses, including electrical power generation under the zoning by-law of St. Clair Township.

The site is located immediately east of Hydro One's 230 kV transmission corridor for circuit L28C. The power plant design is based on the successful technology used for natural gas combined cycle power generation throughout the world. A site plan showing the location and main elements of the facility, including the location of the emission stack is shown in Figure 2. A simplified flow diagram of the process for the power plant is attached as Figure 3. The thermal efficiency of the plant will be about 48%, based on engineering calculations using industry standard software.

Figure 2 - Site Plan

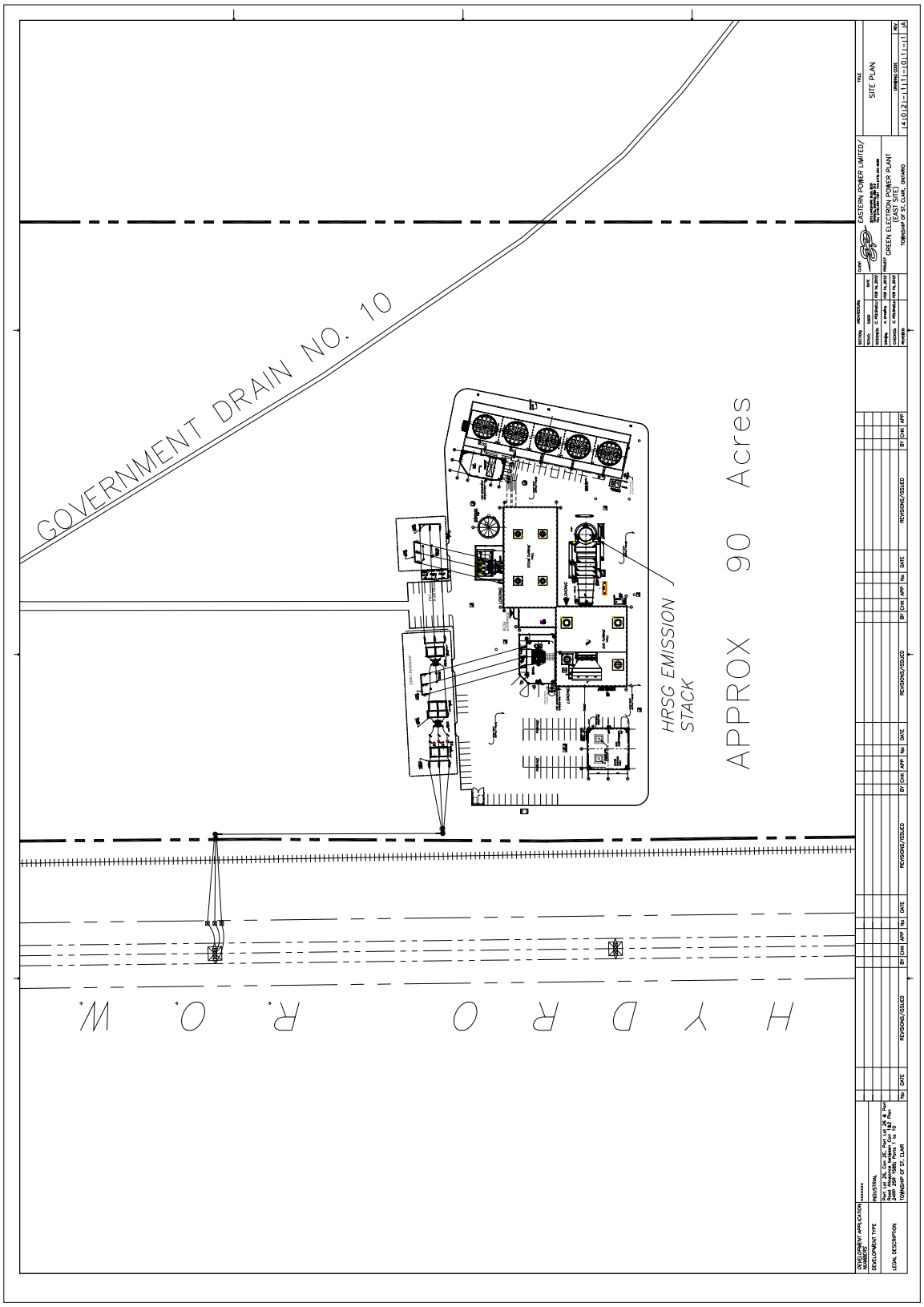
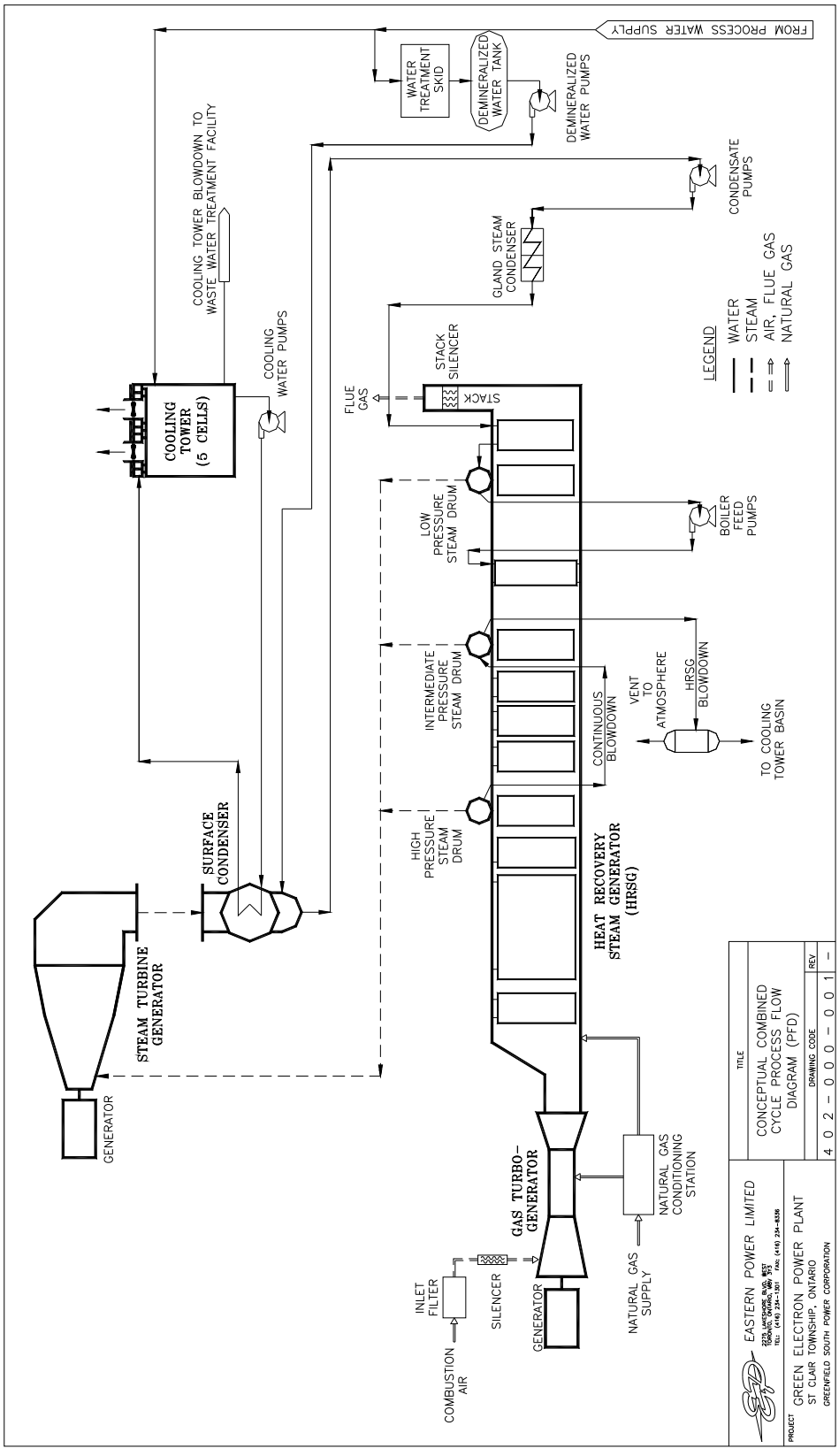


Figure 3 - Process Flow Diagram



1.1.1 Gas Turbine Generator Set

The power plant design will utilize one General Electric 7FA gas turbine generator set fuelled by natural gas. The gas turbine driven generator will be rated nominally at 217 MVA.

1.1.2 Heat Recovery Steam Generator

The power plant design is based on the use of a water-tube, heat recovery steam generator (HRSG) equipped with an auxiliary duct burner fuelled by natural gas. The HRSG will be shop-constructed and site assembled. The HRSG will be rated to deliver all of the steam required by the steam turbine generator.

The steam generating system will include an economizer, multiple pressure cycles (high pressure, intermediate pressure and low pressure steam re-heaters), pressure relief valves as well as other "trim" valves and piping.

1.1.3 Steam Turbine Generator Set

The power plant will utilize one steam turbine generator set. The unit will be purchased "packaged" with all accessories so as to reduce site installation time. The steam turbine driven generator will have a nominal rating of about 158 MVA.

1.1.4 Condenser and Boiler Feed Water Systems

The condenser will be a shell and tube heat exchanger, that will be cooled by a conventional forced draft cooling tower. The condenser will be designed to maintain the backpressure required by the full load on the steam turbine. The cooling tower is expected to evaporate and release to the air approximately 20 - 78 litres/second of water.

The boiler make-up water treatment system will use reverse osmosis, softener, and deionizer units to upgrade city water. The closed-loop condensate and boiler feedwater system will consist of a condensate receiver, a holding ejector, boiler feed pumps and condensate return pumps.

1.1.5 Electrical System

The electricity will be generated at 18kV by the combustion turbine generator and at 13.8kV by the steam turbine generator. This power will flow through generator step up transformers to feed the power plant’s internal loads (via the tertiary winding of the steam turbine generator step up transformer) and then the remainder will be exported to the Hydro One transmission system at 230 kV via the high voltage switchyard .

The high voltage substation will include hot-dip galvanized steel terminal structures with circuit breakers, disconnect switches, bus, bus supports, lightning arrestors, connectors, cables, trays,

etc., as well as the main output transformers. The substation will be located adjacent to the generating plant and will be enclosed by a barbed-wire fence.

The main output transformers will be oil-filled and rated at about 250 MVA and 200 MVA, respectively with two stages of fan cooling. The transformers will be equipped with a no-load tap changer, as well as temperature, pressure and oil level instrumentation.

Switchgear line-ups will include electrically operated generator circuit breakers and medium and low voltage circuit breakers and fused disconnects to isolate the medium voltage and low voltage switchgear and motor control centres. Current transformers and potential transformers for metering and protection will also be mounted in the switchgear. Cables or bus bars meeting the electrical safety codes will be used to connect the generators, switchgear, and transformers.

A construction phase service and back-up power source connection for the plant will be provided from the existing adjacent electricity distribution system of Hydro One Networks Inc.

A relaying and metering panel will be provided to house the relaying and protection equipment, which will meet the requirements of Hydro One and the IESO, including high speed, high band width communication capability if necessary. The medium voltage station service transformers will be of a dry-type and will be located indoors. Low Voltage Switchgear will be provided on the secondary side of the unit auxiliary transformers to feed power to the motor control centres.

1.1.6 Civil Works

The plant building will be a braced steel structure enclosed with pre-painted metal siding. The roof will consist of a metal roof and/or built-up membrane roofing. The operating floor and mezzanine floors will be of reinforced concrete construction, and the other platforms and walkways will be of steel grating. Each turbine bay will be served by an electrically-operated, overhead crane. Windows and louvers will be provided as required for appearance and function. Acoustical and/or weather enclosures will be provided where required.

The area surrounding the plant will be graded to facilitate proper drainage of precipitation. A septic system will be used for the sanitary sewage system. Asphalt pavement will be provided for primary walkways, driveways, and staff parking lot. Gravel paving will be used for secondary areas.

Landscaping will consist of pressure seeding of grass and planting of trees and shrubbery to meet the municipality's site plan approval requirements. A chain link fence will be provided around the plant and electrical substation.

1.1.7 Instrumentation and Controls

The plant control system will be designed so that the plant can be operated from the control room, where the status of all systems can be monitored.

1.1.8 Electrical and Natural Gas Interconnection

The plant will be electrically interconnected with the 230 kV circuits of Hydro One, and for back-up power, it will also be interconnected with the distribution circuits of Hydro One Networks Inc. The plant will receive natural gas from a nearby pipeline. The general location for these interconnections is shown in Figure 2 (Site Plan).

2 Existing Environmental Conditions

2.1 Existing Climate Conditions

The London International Airport Weather Station's historical data was used to analyze the existing climatic conditions for the Green Electron east site. Although this weather station is not the closest proximity to the project location, the Ministry of the Environment accepts regional meteorological data sets for screening purposes. The London International Airport Weather Station meets the World Meteorological Organization (WMO) Standards for providing climate normal data.

Southwestern Ontario has a continental climate that is moderated by the Great Lakes. Table 1 shows the monthly climate normals from 1971 to 2000. The table shows that the hottest month is July with a normal temperature of 20.5 °C and an extreme maximum of 38.2 °C in July 25, 1988. The coldest month is January with a normal temperature of -6.3 °C and an extreme minimum of -31.7 °C in January 24, 1970. The average annual temperature is about 7.5 °C.

The expected total precipitation for the year is 987.1 mm with a minimum of 60 mm in February and a maximum of 97.7 mm in September. Precipitation lowers the concentration of contaminants in the air. However, for the purpose of this report, the effect of precipitation was assumed to be negligible and therefore, the analyses in this report represent conservatively high estimates of the maximum ground level concentrations of contaminants that will be emitted by the Green Electron East Site Power facility.

The average wind speed for the year is 14.6 km/h with a maximum average speed of 87 km/h in January and a minimum average speed of 56 km/h in August. The predominant wind direction ranges from the west from April to August (inclusive) to the southwest (October to January, inclusive), and with wind direction from the east in March and September. The yearly average wind direction is from the west. There were about 8 days of maximum wind speeds of equal to or greater than 14.4 m/s.

See Figure 9 for the wind rose diagram showing the distribution of directions of wind speeds. Figure 9 was created by using the WRPLOT (Wind Rose Plot) subroutine of the AERMOD software.

Table 1 London International Airport Climate Norms 1997-2001

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Daily Average (˚C)	-6.3	-5.5	-0.3	6.3	13	18	20.5	19.5	15.3	9	3.1	-3	7.5
Daily Maximum (˚C)	-2.4	-1.4	4.2	11.6	19	23.8	26.3	25.2	20.9	14	6.9	0.6	12.4
Daily Minimum (˚C)	-10.1	-9.7	-4.7	1.0	7	12.1	14.6	13.7	9.6	4	-0.7	-6.5	2.5
Extreme Maximum (˚C)	16.7	17.8	24.8	29.4	32.4	38.2	36.7	37	34.4	30	24.4	18.5	NA
Extreme Minimum (°C)	-31.7	-29.5	-24.8	-12.2	-5	-0.6	5	1.5	-3.3	-11.1	-18.3	-26.9	NA
Relative Humidity (%)	77	73.3	67.9	58.9	54.9	57	57.6	60.4	61.4	64.5	73.9	78.4	65.4
Rainfall (mm)	31.1	29.1	53.8	73.8	82.6	86.8	82.2	85.3	97.7	74.9	73.7	47	817.9
Snowfall (cm)	52.6	38.1	28.6	9.2	0.3	0.0	0.0	0.0	0.0	2.7	19.7	51.1	202.4
Total Precipitation (mm)	74.2	60	78.4	82.2	82.9	86.8	82.2	85.3	97.7	77.6	91.1	88.6	987.1
Wind Speed (km/h)	18.5	16.7	17.3	16.3	14.3	12.5	10.9	9.9	11.5	13.8	16.3	17	14.6
Frequent Wind Direction	SW	W	E	W	W	W	W	W	E	SW	SW	SW	W
Maximum Hourly Speed (km/h)	87	68	93	74	89	80	63	56	58	65	72	74	NA
Direction	S	SW	SW	W	W	W	SW	W	NW	W	W	SW	W

2.2 Existing Air Quality and Accumulative Assessment Methodology

The existing Greater Sarnia Region's air quality is dependent on both local and long range emission sources. To assess the effect of emissions from the project, historical air quality data (2006, 2007, 2008, 2009 and 2010) recorded at the MOE continuous air quality monitoring station in Sarnia, Station ID# 14064, at Front St. N./CN Tracks, Centennial Park was used in order to obtain a baseline air quality condition for the surrounding area. Since the MOE monitoring is about 20 km north of the proposed facility, air quality data were also taken from the Sarnia-Lambton Environmental Association (SLEA), for the purpose of qualifying the use of the air quality data at the MOE Sarnia air monitoring station. Established in 1952, SLEA is a non-profit co-operative comprised of 20 industrial manufacturers in the Sarnia-Lambton area of Southwestern Ontario. SLEA monitors ambient environmental conditions to assess the impact of its members on the local environment (air, water and soil). Part of SLEA mandate is to share this information with government agencies and the Sarnia-Lambton community.

Table 2a and 2b show the ambient background contaminant concentrations, in the area surrounding the project as reported from these MOE and SLEA sampling stations, respectively. Shown are the 90th percentiles for each contaminant species. This value represents the average of the highest concentrations for the contaminant detected in the ambient air at the 2 sampling stations over a sampling interval representing 90% of the total sampling time. Local air quality will therefore be of better quality than the 90th percentile values shown in Tables 2a and 2b, 90% of the time. Thus, excluding spurious events that may transiently cause a large increase in the ambient air quality concentration of a substance for only a very short time, the 90th percentile values can be regarded to represent the typical “poorest” air quality at these monitoring stations. These 90th percentile values were therefore used to provide a conservative assessment of the impact of the Green Electron east site facility on the local air quality.

Thus, for the purpose for this emissions study and to provide conservative analyses, the average 1-hr 90th percentile contaminant concentrations of the five-year historical air quality data, as well as the other averaging time concentrations as listed in Table 2a, were used to represent the background concentration in the air shed of the proposed power plant.

Tables 2a and 2b also show maximum values and these represent the maximum value occurrence of a particular year.

Table 2a Summary of MOE Ambient Air Quality in Sarnia

Species	Parameter	2006	2007	2008	2009	2010	5 yr Avg	Annual Max	5 yr Avg (µg/m^3)	Annual Max (µg/m^3)
Carbon Monoxide (CO) ppm	1 hr 90th Percentile	0.44	0.30	0.27	0.28	0.30	0.32	0.44	385.6	530.3
	8 hr Maximum	0.61	0.85	0.58	0.91	0.63	0.72	0.91	867.7	1096.7
Nitrogen Dioxide (NO_2) ppb	1 hr 90th Percentile	23	23	23	18	17	20.8	23	41.2	45.5
	24 hr Maximum	32	33	29	25	28	29.4	33	58.2	65.3
Nitrogen Oxide (NO) ppb	1 hr 90th Percentile	8	7	6	5	4	6	8	7.7	10.3
PM10 µg/m^3	1 hr 90th Percentile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	24 Hr Maximum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PM2.5 µg/m^3	1 hr 90th Percentile	23	24	23	18	21	21.8	24	21.8	24
	24 Hr Maximum	39	46	40	27	35	37.4	46	37.4	46
Sulphur Dioxide (SO_2) ppb	1 hr 90th Percentile	19	19	17	10	9	14.8	19	40.8	52.3
	24 Hr Maximum	107	87	194	39	45	94.4	194	260.0	534.4
	1 yr Mean	8.3	8	7.7	4.5	3.9	6.5	8.3	17.9	22.8

Notes:

- ppm and ppb converted to µg/m3 using the following formulae: (ppm)(12.187)(MW)(1000) / (273.15 + °C) and (ppb)(12.187)(MW) / (273.15 + °C) at 10 °C, where MW is the molecular weight of the species or contaminant.
- The MOE air quality reports for 2006 through 2010 do not include PM10 data.

Table 2b Summary of SLEA Ambient Air Quality River Bend Corunna

Species	Parameter	2007	2008	2009	2010	2011	5 yr Avg	Annual Max	5 yr Avg ($\mu g/m^3$)	Annual Max ($\mu g/m^3$)
Carbon Monoxide (CO) ppm	1 hr 90th Percentile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	8 hr Maximum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nitrogen Dioxide (NO_2) ppb	1 hr 90th Percentile	16	13	14	4	13	12	16	23.8	31.7
	24 hr Maximum	64	43	43	52	62	52.8	64	104.9	126.7
Nitrogen Oxide (NO) ppb	1 hr 90th Percentile	4	3	4	13	5	5.8	13	7.5	16.8
PM10 $\mu g/m^3$	1 hr 90th Percentile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	24 Hr Maximum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PM2.5 $\mu g/m^3$	1 hr 90th Percentile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	24 Hr Maximum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sulphur Dioxide (SO_2) ppb	1 hr 90th Percentile	24	15	12	11	12	14.8	24	40.8	66.1
	24 Hr Maximum	291	230	191	163	182	211.4	291	582.3	801.6
	1 yr Mean	8	6	5	4	4	5.4	8	14.9	22.0

Notes:

- ppm and ppb converted to µg/m3 using the following formulae: (ppm)(12.187)(MW)(1000) / (273.15 + °C) and (ppb)(12.187)(MW) / (273.15 + °C) at 10 °C, where MW is the molecular weight of the species or contaminant.
- The SLEA air monitoring station for 2007 through 2011 do not include CO, PM10, and PM2.5 data.

3 Facility Atmospheric Emissions

Atmospheric emissions from the Green Electron facility will result from one natural fired gas turbine generator with all of its flue gas exhausting through one heat recovery steam generator (HRSG), equipped with a natural duct burner. The emissions from this system will be exhausted through a single 43 m high stack.

The total heat input of the space heaters is approximately only 0.1% of the total heat input to the gas turbine generator and HRSG. Therefore, space heater emissions to the atmosphere can be assumed to be negligible and were not included in the present analyses. Similarly, other very minor sources of potential fugitive emissions arising from the use of transformer cooling oils, machinery lubricants, water treatment chemicals and general cleaning materials were considered to be insignificant for the purposes of the present analyses and were not further assessed.

3.1 Power Plant Stack Emissions

Combustion of natural gas produces the primarily the following direct emission products:

- NOx – consists of primarily NO and trace amounts of NO_2
- CO – resulting from incomplete combustion
- SO_2 – resulting from mercaptan odorant additive
- PM10 – particulate matter below 10 microns in size
- PM2.5 – particulate matter below 2.5 micron in size

For the purpose of these analyses, all particulate matter emissions are assumed to be PM2.5. The emission rates for the above products were obtained from the gas turbine and low NOx duct burner. The gas turbine generator will be equipped with dry low NOx burner technology.

The project will result in the indirect emissions of ground-level ozone (O_3), which results from the chemical reaction of NOx, oxygen and sunlight. Some NO_2 reacts with sunlight to produce ozone and NO. Some NO reacts with the ozone in the atmosphere to produce NO_2.

The combustion of natural gas also produces trace quantities of various volatile organic compounds (VOC), as non-combusted fuel and trace quantities of polycyclic aromatic hydrocarbons (PAH). For the purpose of this emission study, emission factors from US EPA AP-42 were used for VOCs and PAHs. Tables 6 through 9 in Section 9.1 (see below), summarize all the potential atmospheric emissions and their rates of emission from the power plant when utilizing natural gas.

4 Operating Scenarios

The power plant is expected to operate only during periods of high and intermediate demand for electricity, typically on non-holiday weekdays. During this period, the power plant is projected to operate at or near 100% capacity, up to 10.9 hr per non-holiday weekday. The duct burners will operate to provide additional heat input for the steam turbine driven generator to achieve a nominal net electrical output of up to 330 MW in some situations.

The following operating scenarios and their associated emission rates were considered in this study:

Maximum Emission Scenario (start-up conditions, followed by Full Load Operations)

Start-Up Conditions

Given the expected peak and shoulder operating pattern of the project, the Facility is expected to undergo approximately 295 start-ups per year, representing about 16% of the total operating hours. The length of time since the unit was last shut down determines the type of start-up procedure to be followed: hot, warm or cold. The three types of start-up vary in the time that the gas turbine will be warmed up by operation at 10% load and then ramped more or less evenly back to full load. Approximately 5 start-ups are expected to be hot starts, 270 are expected to be warm starts and 20 are expected to be cold starts. Note that the HRSG auxiliary duct burner will not be in operation during any of the startup conditions as discussed below.

Warm Start

A warm start procedure will be used whenever the gas turbine is started within 48 hours of its previous shutdown. Given the expected peak and shoulder operating pattern of the project, approximately 92% of all start-ups will be warm starts. During a warm start the gas turbine will operate at 0% load for 30 minutes, then at 10% load for about 50 minutes and then ramp more or less evenly up to 100% load over 40 minutes. There are no significant emissions during the 30 minutes at 0% load

Hot Start

The hot start procedure will be used whenever the gas turbine is started within 8 hours of its previous shutdown. Given the expected peak and shoulder operating pattern of the project, hot starts will be used primarily following electrical trips due to quick clearing faults. During a hot start the gas turbine will operate at 0% load for 30 minutes, then at 20% load for about 30 min and ramp up more or less evenly to 100% load over 10 minutes. There are no significant emissions during the 30 minutes at 0% load.

Cold Start

The cold start procedure will be used whenever the gas turbine is started after being shut down for at least 72 hours. Given the expected peak and shoulder operating pattern of the project,

cold starts will be used very infrequently (20 or less per year). During a cold start the gas turbine will operate at 0% load for 30 minutes, then at 8% load for about 120 minutes and ramp up more or less evenly to 100% load over 30 minutes. There are no significant emissions during the 30 minutes at 0% load.

Assessment of Start-up Impact

Start-up conditions have been analyzed in detail in terms of their capacity for brief intervals with higher rates of emissions. Table 9 summarizes the emission rates during the entire start-up period (light-off to full load) for the cold start scenario, since this start-up yields the highest emission rates for NOx and PM, according to the averaging period for the relevant MOE POI Limit corresponding to the respective contaminant. Similarly, the warm start scenario was used for CO and the hot start scenario was used for SOx. Although the gas turbine manufacturer has indicated that the emission rate for PM10 can be taken as 100% PM2.5, they only provided PM10 emission rates for full load conditions. Section 3.1 of the US EPA AP-42 shows that total particulate matter emissions from natural gas fired are the same at different loads. Therefore, particulate matter emission rates for all start up scenarios were assumed to be equal to particulate matter emission rates at full load.

Full Load Operation

- Gas Turbine operating at 100% capacity.
- Supplementary duct firing at 100% capacity
- Natural gas
- 10.9 hours per week day

5 Greenhouse Gases

Greenhouse gases (GHG) are also products of the combustion of fossil fuels. The main GHG's are carbon dioxide (CO_2) from combustion, methane (CH_4) released as non combusted fuel, and nitrous oxide (N_2O) as potentially produced during combustion. For the Green Electron Power Project, the main greenhouse gas is carbon dioxide, with trace amounts of nitrous oxide and unburned hydrocarbon (UHC) or methane. Table 3 shows the expected total annual greenhouse gas emissions of the proposed Green Electron Power Plant with supplementary duct firing, operating 25% of the yearly hours, 5 hot starts, 275 warm starts, 20 cold starts. Carbon dioxide and methane, emissions rates were provided by the gas turbine and duct burner manufacturers, while nitrous oxide is taken from US EPA AP-42 emission factors. Other US agencies (Department of Energy) have indicated lower combustion related N_2O production in combined cycle natural gas power plants (NREL, 2000), but the EPA's higher emission factor was utilized to be conservative. In addition, fugitive methane fuel releases are also taken as conservatively high estimates in comparison to those reported in life cycle analysis studies (NREL, 2000).

Table 3: Projected Annual Greenhouse Gas Emissions

Greenhouse Gas	Emissions (tonne)	Global Warming Potential	Tonnes of CO_2 (equivalent)
Carbon Dioxide (CO_2)	173,160	1	173,160
Nitrous Oxide (N_2O)	12	310	3,723
Methane (CH_4)	15	21	305
Total GHG	NA	NA	177,186

The impact of GHG emissions is best appreciated in comparison to a baseline for emissions. For the Green Electron Power Project which replaces coal fired generation, the baseline can be described as GHG emissions from coal-fired electrical power facilities. The US DOE has completed a Life Cycle Analysis (LCA) of the GHG reductions using combined cycle natural gas power production in comparison to coal facilities (NREL, 2000). On this basis of comparison, the Green Electron facility will reduce GHG emissions by 52% (determined from data provided in Table 17 of NREL, 2000) from that which would occur using coal.

6 Emission Limits for Gas Turbines

The Ministry of the Environment has adopted as MOE Guideline A-5, a national guideline developed by the Canadian Council of Ministers of the Environment (CCME) which stipulates maximum emission rates for oxides of nitrogen (NOx), carbon monoxide and oxides of sulphur (expressed as SO_2) for any new or modified stationary gas turbine using gaseous, liquid or solid derived fuels. The emission limits are determined by the plant's useful output power at 100% load, its fuel type and whether the unit is run for peaking or not. The guideline defines a peaking combustion turbine as "ordinarily used to supply electric or motive power at periods of high demand or during unforeseen outages. Such a unit will not usually operate more than 7500 hours in any 5-year period and, in those years, a total of no more than 3000 hours during the months of May, June, July, August and September." [11] Since the Green Electron Power Plant is expected to operate about 2200 – 2800 hours per year, the project is not defined as a peaking plant for the purposes of MOE Guideline A-5

The maximum allowable NOx emission rate is therefore arrived at as follows:

Emission Limit (ppmv @15% O_2) = (C x E) / D

Where C = $\frac{\text{Power Output x A}}{\text{Power + Heat Output}} + \frac{\text{Heat Output x B}}{\text{Power + Heat Output}}$

= 139.99 g/GJ for natural gas

A = 140 g/GJ for natural gas (A-5 Table 1)

B = 40 g/GJ for natural gas (A-5 Table 2)

E = Efficiency factor at maximum rating and reference condition = 48.6%

D = Fuel constant (1.70 g NO_2 per GJ heat input for natural gas per ppmv @ 15% O_2)

The above formula yields an emission limit for NOx of 40.0 ppmv for natural gas. With the gas turbine operating at the maximum output and supplementary duct firing, the NOx emission will be 10.1 ppmv using natural gas. Therefore, the Green Electron Plant's emissions will be 25% of the MOE A-5 allowable limit for NOx when using natural gas.

The emission limit for carbon monoxide emission is specified in Section 5.2 of MOE Guideline A-5 as 60 ppmv for natural gas. With the gas turbine operating at the maximum output and supplementary duct firing, the carbon monoxide emission will be 8.4 ppmv for natural gas. Therefore the Green Electron emissions of carbon monoxide emissions will be 14% of the MOE A-5 allowable limit for CO when using natural gas.

For SO_2, the emission limit is defined in Section 5.3 (i) by the following formula:

$$\text{Emission Limit (ppmv 15\% } O_2) = (C \times E) / D$$

where

C = 800 g/GJ (non-peaking gas turbine, liquid or gaseous fuel)

D = Fuel constant (2.37 g NO2 per GJ heat input for natural gas per ppmv @ 15% O_2)

E = Efficiency factor at maximum rating and reference condition= 48.6 %

As a result, the emission limit for SO_2 is 164.1 ppmv for natural gas. The expected emission of SO_2 is 0.086 ppmv for natural gas (0.05% of the A-5 limit) at 15% O_2 reference conditions.

The above results show that the proposed gas turbine and HRSG duct burner will meet the MOE A-5 emission limit guidelines for NOx, CO, and SO_2. The MOE A-5 Guideline requires testing after commissioning to verify the actual installed power plant thermal efficiency.

7 Proposed Emissions Monitoring Program

The proposed power plant will require an emissions monitoring program that may include predictive/parametric emissions monitoring, continuous emissions monitoring, stack sampling, fuel analysis and/or comparison to published emission factors. The selection of one of these monitoring program will depend on the specific approach of compliance with Guideline A-5 and O.Reg. 397/01. The emission data and plant information will be submitted to the MOE as per the regulation and published guideline.

8 Air Dispersion Modeling

8.1 Assessment Criteria

Ontario Regulation 419/05 establishes limits for half-hour, one hour and 24 hour contaminant concentration at certain critical points of impingement (POI), which all facilities must meet. These point of impingement criteria addresses the facility's emission impacts on its surroundings.

The MOE has also established air quality targets for contaminant concentrations called Ambient Air Quality Criteria (AAQC), which is considered an acceptable concentration of an air contaminant to protect human health or the environment. The AAQCs are assigned different averaging times (e.g., 24 hour, 8 hour and 1 hour) appropriate for the adverse effect that they are intended to protect against. The effects that are considered are health, odour, vegetation, soiling, visibility, corrosion or other effects.

For the purpose of this assessment, only nitrogen oxides (NOx), carbon monoxide (CO), sulphur dioxide (SO_2), and particulate matter (PM assumed to be 100% PM2.5) were evaluated because these have the greatest impact on air quality surrounding the power plant. Volatile Organic Compounds (VOCs) emissions will be very small but they were also modelled. However, since no AAQC for VOCs have been established, their impact on ambient air quality cannot be determined directly. Nevertheless, VOCs have been shown in several independent studies of similar power plants in similar environmental settings to have very low potential health or environmental impacts (see Cantox, 2000 and Senes, 2003). The maximum POI (MPOI) values for the VOC and main species have also been determined and analyzed in relation to the potential health impacts of the Green Electron East Site facility.

Recent studies have shown very large variations in results for detected PM2.5 depending on the sampling methodology utilized and it was therefore concluded that reliable emission rates for PM2.5 from gas turbines are yet to be established. [30,31,32] More significantly, natural gas turbine facilities are now understood to have very low particulate emissions, as there is no active mechanism for their generation from methane combustion, where SCR control technology is not employed (Klein, Environment Canada, 2005). Additionally, the Green Electron Power project can be said to achieve a net reduction in all PM species, especially those containing trace heavy metals etc, by virtue of enabling the phasing out of coal fired electricity generation (MOE, 2001 and MOE, 2005). However, for the purpose of this analysis, all particulate matter emissions from the gas turbogenerator and the HRSG duct burner are assumed to be PM2.5, for conservatism.

Table 4 shows the MOE POI Criteria and AAQC for each of the species and sub species of interest in this assessment.

Table 4 - MOE POI Criteria Limits and Ambient Air Quality Criteria

Species	Averaging Period	MOE POI Criteria (ug/m^3)	MOE AAQC (ug/m^3)
NOx	NOx 1 hr	400	400
	NOx 24 hr	200	200
CO	½ hr	6000	NA
	1 hr	NA	36200
	8 hr	NA	15700
	24 hr	NA	NA
SOx	1 hr	690	690
	24 hr	NA	275
	Annual	NA	55
PM10	24 hr	NA	501
PM2.5	24 hr	NA	302

8.2 Methodology

The Facility is subject to s.20 of O. Reg. 419/05 and as such, the assessment of compliance with Schedule 3 standards, with the additional assessment of AAQCs compliance, was carried out with the aid of the U.S. EPA AERMOD atmospheric dispersion model. Dispersion modeling was completed in accordance with the MOE Guideline A-11 "Air Dispersion Modeling Guideline for Ontario, Version 2.0" dated March 2009 (ADMGO). A general description of the input data used in the dispersion model is provided below.

The AERMOD modeling system has been identified by the MOE as one of the approved dispersion models under O. Reg. 419/05, and currently includes the Plume Rise Model Enhancements (PRIME) algorithms for assessing the effects of buildings on air dispersion. It is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases, and multiple sources such as point, area, and volume sources. The AERMOD modeling system is made up of the AERMOD dispersion model, the AERMET meteorological pre-processor and the AERMAP terrain pre-processor.

The following approved dispersion model and pre-processors were used in the assessment:

- AERMOD dispersion model (v. 11103)
- AERMAP surface pre-processor (v. 11103)
- BPIP building downwash pre-processor (v. 04274)

AERMET was not used in this assessment, as a pre-processed MOE meteorological dataset was used.

The following meteorological elements were used in AERMET processing for the 5 year period from 1996 to 2000: ceiling height, wind speed, wind direction, air temperature, total cloud opacity and total cloud amount. Anemometer height of 10 meters was used. For the purpose of this analysis, the surface meteorological data sets were gathered from the London International Airport and the upper air meteorological data were gathered from the White Lake Upper Air Station (closest upper air station to the site), using the "crop" data set.

The following 5000 m x 5000 m nested receptor grid of 1801 receptor points was used to predict on-site and off-site contaminant concentration profiles, centered around the HRSG stack:

a) 20 m spacing, within an area of 200 m by 200 m
b) 50 m spacing, within an area surrounding the area described in (a) with a boundary at 300 m by 300 m outside the boundary of the area described in (a)
c) 100 m spacing, within an area surrounding the area described in (b) with a boundary at 800 m by 800 m outside the boundary of the area described in (a)
d) 200 m spacing, within an area surrounding the area described in (c) with a boundary at 1,800 m by 1,800 m outside the boundary of the area described in (a)
e) 500 m spacing, within an area surrounding the area described in (d) with a boundary at 4,800 m by 4,800 m outside the boundary of the area described in (a)

In addition to using the nested receptor grid, receptors were also placed every 10 metres along the property line.

Terrain data used in this assessment was obtained from the MOE (7.5 minute format). DEM files used in this assessment are:

- 0701_3.DEM
- 0701_4.DEM
- 0702_3.DEM
- 0702_4.DEM
- 0742_1.DEM
- 0743_1.DEM

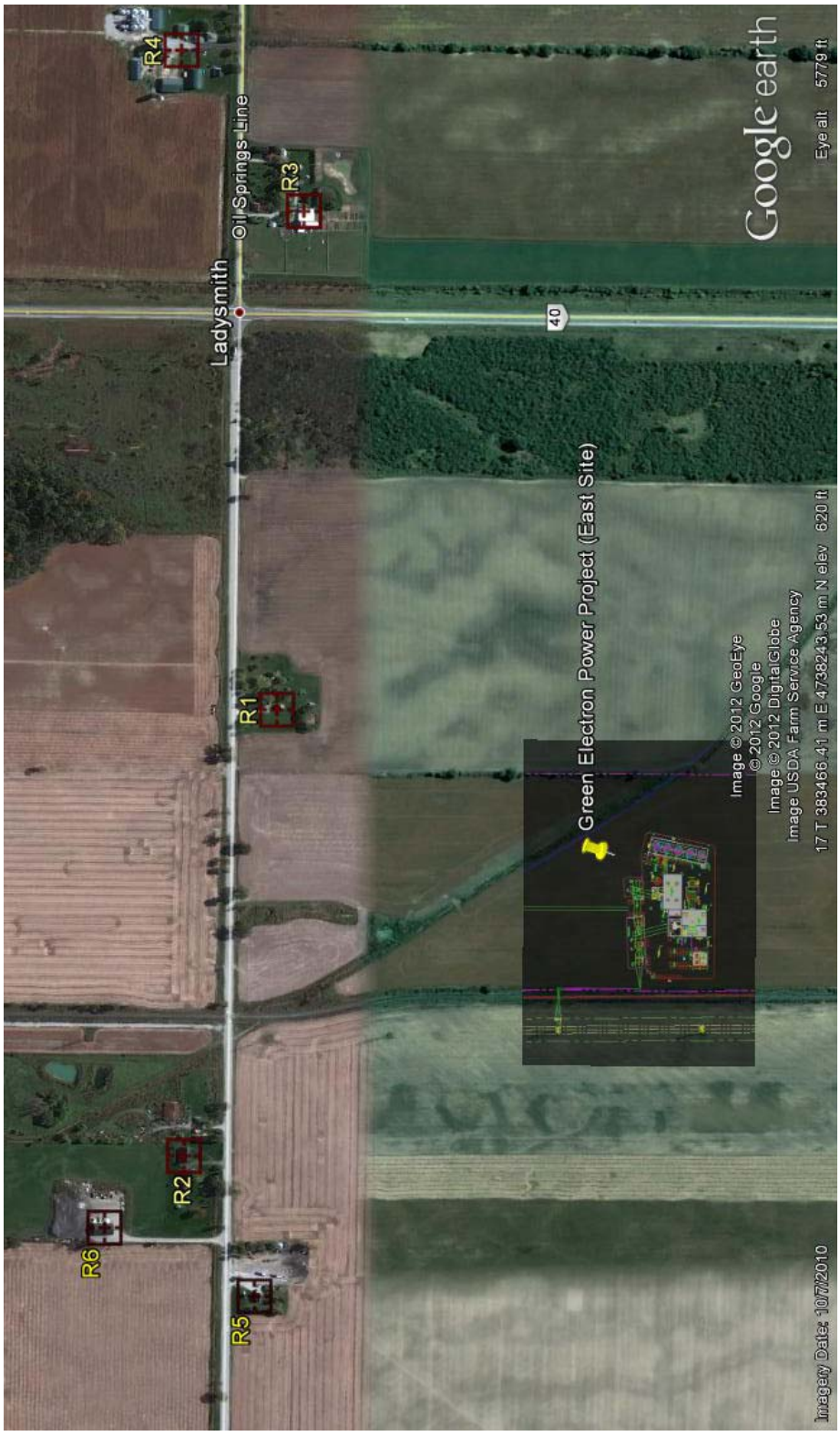
8.3 Receptors of Interest

The receptors of interests are the nearest residential dwellings. The nearest residential dwellings of 1 and 2 storey buildings are located along Oil Springs Line as listed in Table 5 and located as shown in Figure 4. Although there are additional residences in the surrounding area, these receptors of interests were specifically chosen because they are the closest to the proposed power plant.

Table 5 - Receptors of Interest

Receptors	Description
R1	Residential - 2 Storey
R2	Residential - 2 Storey
R3	Residential - 2 Storey
R4	Residential - 2 Storey
R5	Residential - 2 Storey
R6	Residential - 2 Storey

Figure 4 - Receptors of Interest



8.4 Stack Plume and Cooling Tower Plume Visibility and Icing Analysis

Water vapour will be released from the proposed facility both as a combustion product from the stack and from the cooling tower. Under certain atmospheric conditions this water release to the air can be visible as a plume. Ambient air can only hold a certain amount of water vapour (the moisture ratio = mass of water to mass of air) that depends on the ambient dry bulb temperature. The lower the ambient temperature, the lower the moisture carrying capacity of the air. Relative humidity indicates the amount of water vapour in ambient air relative to the amount of water vapour that air would be able to hold if it were saturated with water vapour. Moisture plume visibility depends on the ability of the ambient air to absorb the plume water vapour. If the ambient air is saturated, it cannot absorb additional water vapour and a water vapour plume will be visible. The length of the visible plume depends on the required dispersion or dilution of the moisture plume within the ambient air that is needed in order to reduce the moisture concentration in the plume below the saturation level of the ambient air. Appendix A details the cooling tower plume and icing analysis.

It has been reported, from similar facilities, of a yellow-brownish plume discharge from the HRSG stack. This visible plume is the result from the presence of elevated nitrogen oxides in the flue gas. This normally occurs during the start-up of the facility. As noted in Section 4, the emission rate of nitrogen oxides is at its maximum during the start up phase of the gas turbine were fuel combustion is at its lowest efficiency (see Table 7). Once the gas turbine reaches peak efficiency, the nitrogen oxide emission rates drops to approximately half that during start up. As discussed in Section 9.3, the dispersion modelling results show that the nitrogen oxide concentration is well below the MOE Point of Impingement Criteria and as well as the MOE Ambient Air Quality Criteria, using the worst case emission flow rate scenario - start up, followed by full load operation.

9 Dispersion Modeling Results

9.1 Summary of Emissions

Table 6 shows a summary of expected emissions and their rates of emission from all sources from the facility. Tables 7 shows the expected start-up emission rates and Table 8 shows the expected emission rates on the individual start-up conditions, followed by full load operation. Table 9 shows the expected maximum emission rates on start up, followed by full load operation. Table 9 was derived from Table 8, by choosing the start-up condition that yields the maximum emission rate. All tables for Source ID 1, HRSG Stack are for full load operation, which includes supplementary duct firing. As seen in the tables below, Source ID 1 emits the largest amount of emissions with oxides of nitrogen, carbon monoxide, particulate matter (assumed to be 100% PM2.5) being the most significant emissions . Therefore, only these significant contaminants were analyzed further and are discussed with respect to accumulative

ambient air and point of impingement impacts, using the expected maximum emission rates from Table 9. All emission rates in the Tables below are based on design operating conditions of 7°C ambient temperature (i.e. near the average annual temperature, see Table 1) and 10.9 hrs of weekday operation.

Table 6 - Expected Emissions from all Facility Sources

Source ID	Description	Source Data					Emission Data				
		Exhaust Flow (kg/s)	Flow Temp. (^{o}C)	Stack Dia. (m)	Height Above Grade (m)	Height Above Roof (m)	Contaminant[3]	Emission Rate (g/s)	Data Quality[1]	Estimation Type[2]	Percentage of Overall Emission
1	HRSG Stack	461.9	87	5.5	43	20	NO_x	10.40	C	EC	99.94%
							CO	9.76	C	EC	99.99%
							PM	1.63	C	EC	99.68%
							SO_2	0.12	B	EF/EC	99.97%
							Acetaldehyde	0.00794	C	EF	99.9%
							Acrolein	0.00127	C	EF	99.9%
							Benzene	0.00238	A	EF	99.9%
							Ethyl Benzene	0.00635	C	EF	99.9%
							Formaldehyde	0.141	A	EF	99.9%
							Xylene	0.0127	C	EF	99.9%
							UHC	1.71	C	EC	99.9%
							Naphthalene	0.000258	C	EF	99.9%
							Nitrous Oxide	0.678	E	EF	99.9%
							Total PAH	0.000437	C	EF	99.9%
							Propylene Oxide	<0.00575	D	EF	99.9%
							Toluene	0.0258	C	EF	99.9%
							Total VOC	1.80	D	EF	99.9%
2	Cooling Stack 1	519.1 (Nm^3/s)	32	10.6	11.5	3	PM10	0.00498	C	EC	0.3%
	Cooling Stack 2						PM10	0.00498	C	EC	0.3%
	Cooling Stack 3						PM10	0.00498	C	EC	0.3%
	Cooling Stack 4						PM10	0.00498	C	EC	0.3%
	Cooling Stack 5						PM10	0.00498	C	EC	0.3%
3	Natural	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%

Source ID	Description	Source Data					Emission Data				
		Exhaust Flow (kg/s)	Flow Temp. (^{o}C)	Stack Dia. (m)	Height Above Grade (m)	Height Above Roof (m)	Contaminant[3]	Emission Rate (g/s)	Data Quality[1]	Estimation Type[2]	Percentage of Overall Emission
	Gas Fired Heaters 1						CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 2	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 3	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 4	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 5	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 6	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 7	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%

Source ID	Description	Source Data					Emission Data				
		Exhaust Flow (kg/s)	Flow Temp. (^{o}C)	Stack Dia. (m)	Height Above Grade (m)	Height Above Roof (m)	Contaminant[3]	Emission Rate (g/s)	Data Quality[1]	Estimation Type[2]	Percentage of Overall Emission
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 8	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 9	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 10	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 11	0.0043	N/A	0.15	3	N/A	NO_x	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%
	Natural Gas Fired Heaters 12	0.0043	N/A	0.15	3	N/A	0.01	0.005967	C	EC	0.06%
							CO	0.001193	C	EC	0.01%
							PM	0.000340	C	EC	0.02%
							SO_2	0.000036	C	EC	0.02%

Table 7 - Start-up Emission Rates

Source ID	Description	Contaminant[3]	Cold Start Emission Rate (g/s)	Warm Start Emission Rate (g/s)	Hot Start Emission Rate (g/s)	Data Quality[1]	Estimation Type[2]	Percentage of Overall Emission
1	HRSG Stack	NOx	17.76	13.59	21.31	C	EC	99.9%
		CO	28.22	92.81	28.37	C	EC	99.9%
		SOX	0.02	0.031	0.037	C	EC	99.9%
		PM	1.63	1.63	1.63	C	EC	99.9%

Table 8 - Start-up Followed by Full Load Operation Emission Rates

Source ID	Description	Contaminant[3]	Cold Start followed by full load operation Emission Rate (g/s)	Warm Start followed by full load operation Emission Rate (g/s)	Hot Start followed by full load operation Emission Rate (g/s)	Data Quality[1]	Estimation Type[2]	Percentage of Overall Emission
1	HRSG Stack	NOx	**12.04**	10.75	11.04	C	EC	99.9%
		CO	13.88	**18.82**	10.85	C	EC	99.9%
		SOX	0.10	0.11	**0.11**	C	EC	99.9%
		PM	**1.63**	**1.63**	**1.63**	C	EC	99.9%

Notes for Tables 6, 7, and 8:
1. Data quality or emission factor rating is a qualitative measure of uncertainty of the emission factor with an 'A' rating having the lowest uncertainty and an 'E' rating having the highest uncertainty.
2. EC = engineering calculations, EF = USA EPA emission factor
3. Emission rates for NO_x, CO, PM, SO_2 are from gas turbine manufacturer. These emission rates are considered having an average rating of uncertainty (i.e. 'C' rating). PM (particulate matter) assumed to be 100% $PM_{2.5}$.

Table 9 - Start-up Followed by Full Load Operation Maximum Emission Rates

Source ID	Description	Contaminant[3]	Start-up followed by full load operation	Start-up Condition Used
			Maximum Emission Rate (g/s)	
1	HRSG Stack	NOx	12.04	Cold Start
		CO	18.82	Warm Start
		SOX	0.11	Hot Start
		PM	1.63	N/A

9.2 Annual Emissions

Table 10 below shows the expected total annual emission for the proposed power plant with duct firing, using Table 9 emission rates. The annual emissions are based on the expected operating time of 25% of the total yearly hours. Note that PM (particulate matter) is assumed to be 100% PM2.5.

Table 10 - Expected Total Annual Emissions (with duct firing)

Species	Annual Emissions (tonne)
NO_x	94.9
CO	148.4
SO_2	0.90
PM	12.8
UHC (CH_4)	92.5

9.3 Compliance with Point of Impingement Criteria

The maximum concentrations projected by AERMOD for the two operating scenarios (full load operation and start-up, followed by full load operation) were evaluated for compliance with applicable POI criteria. Tables 11 and 12 compare, for each of the two operating scenarios, the expected maximum contaminant concentrations, according to the averaging period for the relevant MOE POI Limit corresponding to that contaminant, against the applicable POI criteria. These tables show that all POI criteria will be met under all operating scenarios at the point of maximum ground level concentration.

Table 11 - Emission Summary Table (Full Load Operation)

Contaminant Name	Contaminant CAS Number	Total Facility Emission Rate [g/s]	Air Dispersion Model Used	Max. POI Concentration [µg/m^3]	Averaging Period	MOE POI Limit [µg/m^3]	Percentage of MOE POI limit
NO_x	10102-44-0	10.40 / 4.72	AERMOD	21.35 / 3.14	1 hr / 24 hr	400 / 200	5.3% / 1.6%
CO	630-08-0	9.76	AERMOD	24.34	0.5 hr	6000	0.4%
SOx	9/5/7446	0.12	AERMOD	0.25	1 hr	690	0.04%
PM	NA	0.74	AERMOD	0.49	24 hr	120	0.4%

Table 12 - Emission Summary Table (Maximum Emission Scenario - Startup followed by Full Load)

Contaminant Name	Contaminant CAS Number	Total Facility Emission Rate [g/s]	Air Dispersion Model Used	Max. POI Concentration [µg/m^3]	Averaging Period	MOE POI Limit [µg/m^3]	Percentage of MOE POI limit
NOx	10102-44-0	12.0 / 7.0	AERMOD	24.64 / 4.68	1 hr / 24 hr	400 / 200	6.2% / 2.3%
CO	630-08-0	18.2	AERMOD	45.38	0.5 hr	6000	0.8%
SOx	9/5/7446	0.11	AERMOD	0.23	1 hr	690	0.03%
PM	NA	0.74	AERMOD	0.49	24 hr	120	0.5%

9.4 Accumulative Assessment and Ambient Air Quality Criteria

Table 13 compares, for each of the two operating scenarios, the one hour contaminant concentrations projected by the AERMOD model from the facility with the 90th percentile local air quality data, against all applicable one hour Ambient Air Quality Criteria. This table shows that all one hour Ambient Air Quality Criteria will be met under all operating scenarios at the point of maximum ground level concentration.

For the full load operation scenario, in comparing the maximum one-hour concentration of NOx and CO to the maximum 90th percentile ambient air concentrations, it can be seen that there is an increase of 51.8% for NO_2 and an increase of only 5.2% for CO in the immediate outfall region close to the facility. SO_2 emissions from the Green Electron facility will have an insignificant effect on the ambient air quality. More importantly, Table 13, reveal that Ambient Air Quality Criteria will not be exceeded due to the Green Electron facility emissions even when ambient air quality is at its poorest in terms of the concentrations of the relevant contaminants.

Table 13 - Dispersion Modeling Results - MOE 1 hr AAQC

Scenario	Species	1 hr AAQC µg/m^3	Maximum 1 hr Concentration (Off property) µg/m^3	Average 90th Percentile (2006 through 2010)		Maximum 90th Percentile (2006 through 2010)	
				Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 1 Full Load Operation	NO_2	400	21.35	41.2	62.55	45.5	66.85
	CO	36200	20.04	385.6	405.64	530.3	550.34
	SO_2	690	0.25	14.8	15.05	19	19.25
Scenario 2 Start-up Followed by Full Load Operation	NO_2	400	24.64	41.2	65.84	45.5	70.14
	CO	36200	38.65	385.6	424.25	530.3	568.95
	SO_2	690	0.23	14.8	15.03	19	19.23

As shown in Table 14, the assessment of the 8 hour impact at the point of maximum CO concentration shows that the maximum 8 hour ground level CO concentration due to the facility will be 30.9 µg/m^3, which when combined with the maximum local ambient level for CO of 1096.7 µg/m^3, will be less than the 8 hour AAQC for CO of 15700 µg/m^3.

Table 14: Dispersion Modeling Results - MOE 8 hr AAQC

Scenario	Species	8 hr AAQC µg/m^3	Maximum 8 hr Concentration (Off property) µg/m^3	Average 8 hr Concentration (2006 through 2010)		Maximum 8 hr Concentration (2006 through 2010)	
				Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 1 Full Load Operation	CO	15700	14.3	867.7	868.35	1096.7	1097.35
Scenario 2 Start-up Followed by Full Load Operation	CO	15700	30.9	867.7	868.91	1096.7	1097.91

Table 15 shows that the applicable 24 hour AAQC will be met at the point of maximum ground level concentration. Table 15 also shows that the maximum 24 hour local ambient

concentration of PM2.5 is already in excess of the MOE AAQC. Given the small impact on the existing maximum 24 hour ambient data (about 1.1% addition to the existing maximum 24 hour ambient concentration), and the uncertainty which exists around whether natural gas fired gas turbines are net emitters of PM2.5, and that this project displaces coal fired generation with higher PM2.5 emissions, this small impact is considered acceptable. PM2.5 start-up condition emission rate was assumed to be equal to the full load emission rate as listed in Table 6 (see US EPA AP-42, Section 3.1). There were no data on the ambient PM10 concentrations at the MOE air monitoring station for the 2006 through 2010.

Table 15 - Dispersion Modeling Results - MOE 24 hr AAQC

Scenario	Species	24 hr AAQC µg/m^3	Maximum 24 hr Concentration (Off property) µg/m^3	Average 24 hr Concentration (2006 through 2010)		Maximum 24 hr Concentration (2006 through 2010)	
				Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 1 Full Load Operation	NO_2	200	3.14	58.2	61.3	65.3	68.44
	SO_2	275	0.079	14.8	14.88	194	194.08
	PM10	50	0.49	N/A	N/A	N/A	N?A
	PM2.5	30	0.49	37.4	37.89	46.0	46.49
Scenario 2 Start-up Followed by Full Load Operation	NO_2	200	4.69	58.2	62.89	65.3	69.99
	SO_2	275	0.079	14.8	14.88	194	194.08
	PM10	50	0.49	N/A	N/A	N/A	N/A
	PM2.5	30	0.49	37.4	37.89	46.0	46.49

As shown in Table 16, shows that the maximum annual ground level SO_2 concentration due to the facility will be 0.0032 µg/m^3, which when combined with the maximum local ambient level for SO_2 of 17.90032 µg/m^3, will be less than the annual AAQC for SO2 of 55 µg/m^3.

Table 16 - Dispersion Modeling Results - MOE Annual AAQC

Scenario	Species	Annual AAQC µg/m^3	Maximum Annual Concentration (Off property) µg/m^3	Annual Mean (1999 through 2003)		Annual Maximum (1999 through 2003)	
				Ambient Levels µg/m^3	Combined Effect µg/m^3	Ambient Levels µg/m^3	Combined Effect µg/m^3
Scenario 1 Full Load Operation	SO_2	55	0.0032	17.9	17.90032	22.8	22.80032
Scenario 2 Start-up Followed by Full Load Operations	SO_2	55	0.0031	17.9	17.90031	22.8	22.80031

9.4 Indirect Air Quality Impacts and Contribution to Regional Smog

NOx emitted by the project will potentially react in the presence of sunlight to produce ozone, at some location downwind of the facility. The rate at which this reaction would occur is dependent on regional and continental meteorological conditions, the regional and continental intensity and duration of sunlight, and the regional and continental mixing patterns of NOx from all regional and continental sources, and the regional and continental concentrations of ozone from other emission sources. Accurate modeling of this atmospheric reaction is therefore very complex and not warranted given the limited impact that the project will have on local or regional smog levels.

As an adequate gauge of the likely impact of the project on local or regional smog it is useful to examine the NOx concentrations due to the project during most smog events (e.g. May through September). The provincial NOx emission in 2000 was about 660 kilotonnes (see "Transboundary Air Pollution in Ontario", June 2005, MOE, Figure 2.5), as compared to the total annual NOx emission of 94.9 tonnes to be emitted by the project (see Table 10, above). Given the project's potential annual NOx contribution is only 0.014% of the total provincial NOx annual emissions, the project can be concluded to represent an insignificant NOx contribution on a province-wide basis for 2000. Therefore, any incremental impact of NOx emissions from the project on O_3 formation would be insignificant when compared to other sources. As a result, the project is not likely to have any noticeable impact on the regional or continental concentration of ground level ozone.

Figures 5 through 8 use isopleths (lines joining locations of equal contaminant concentration) to show the geographic distribution of the expected maximum hourly ground level concentrations

as predicted by the AERMOD model when using the meteorological data set for London that is provided by the MOE for running AERMOD.

The four isopleth diagrams show the results of the worst-case emission scenarios (start-up, followed by full load operation). These figures show that the highest hourly ground level concentrations are expected to occur in three zones located from 260 to 320 m from the stack, and that most of the areas of these local zones would be located to the southeast and southwest of the stack.

Figure 5 - NOx 1 hr Maximum Concentration Isopleths

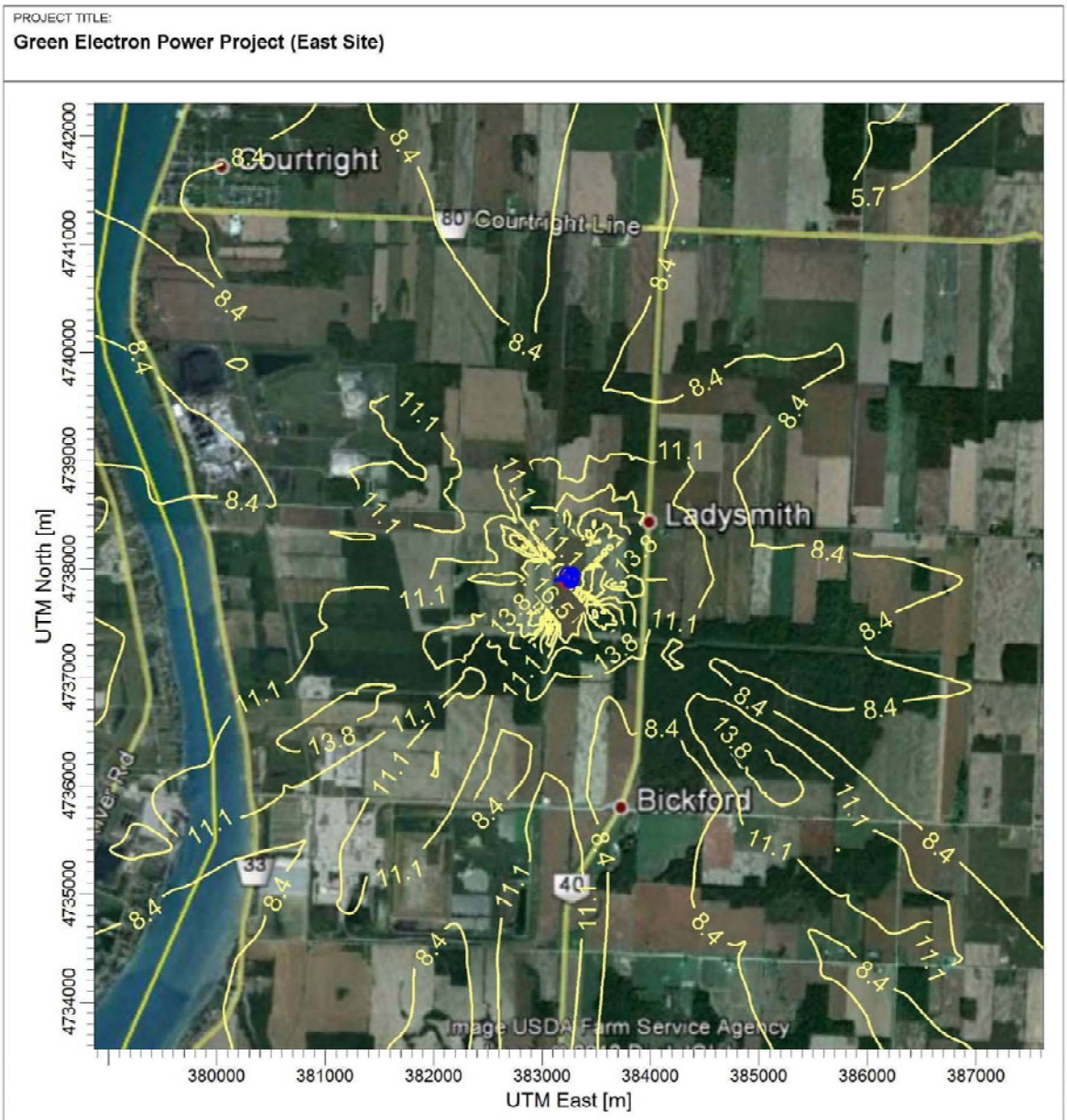


Figure 6 - CO 0.5 hr Maximum Concentration Isopleths

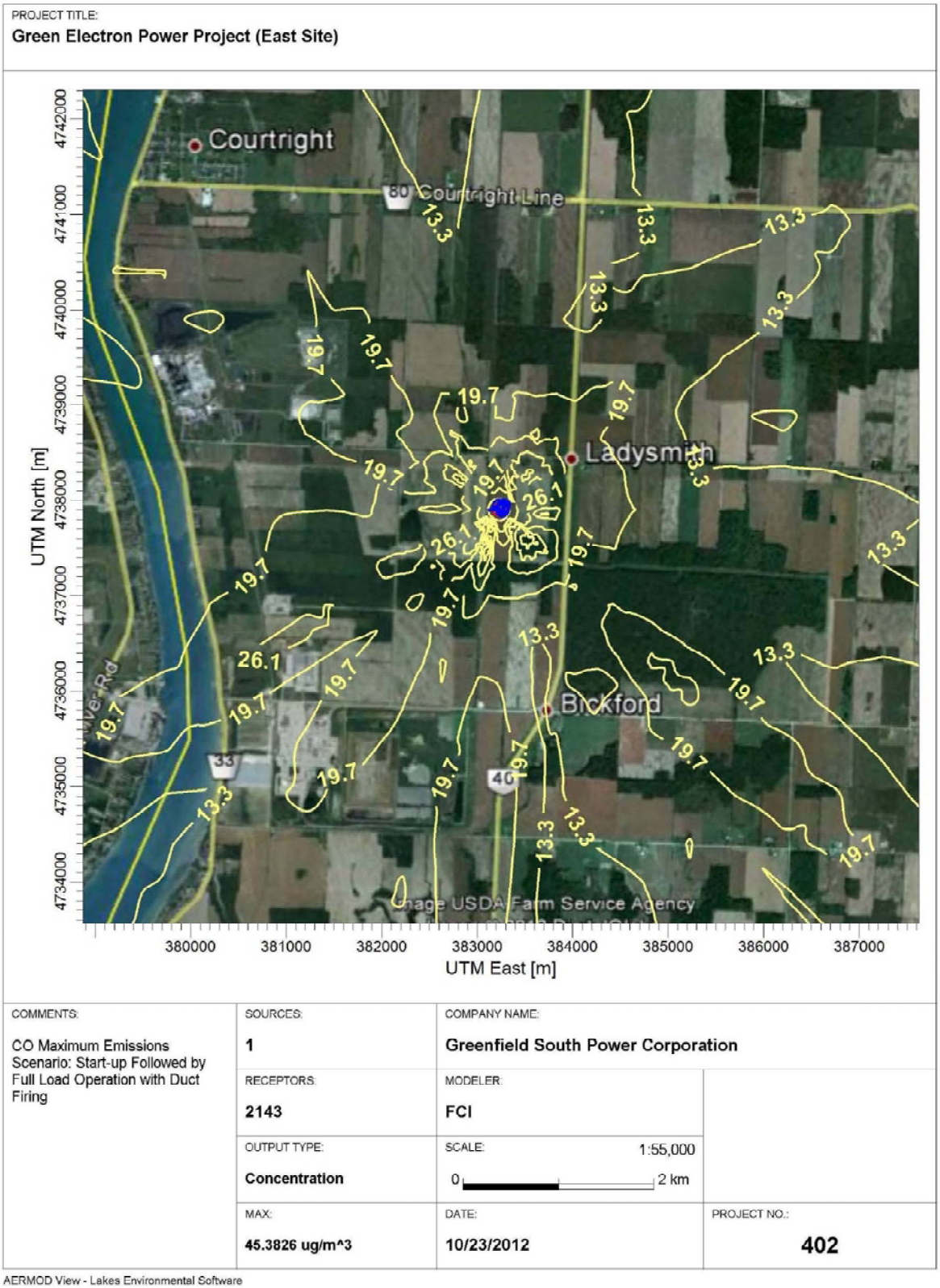


Figure 7 - SOx 1 hr Maximum Concentration Isopleths

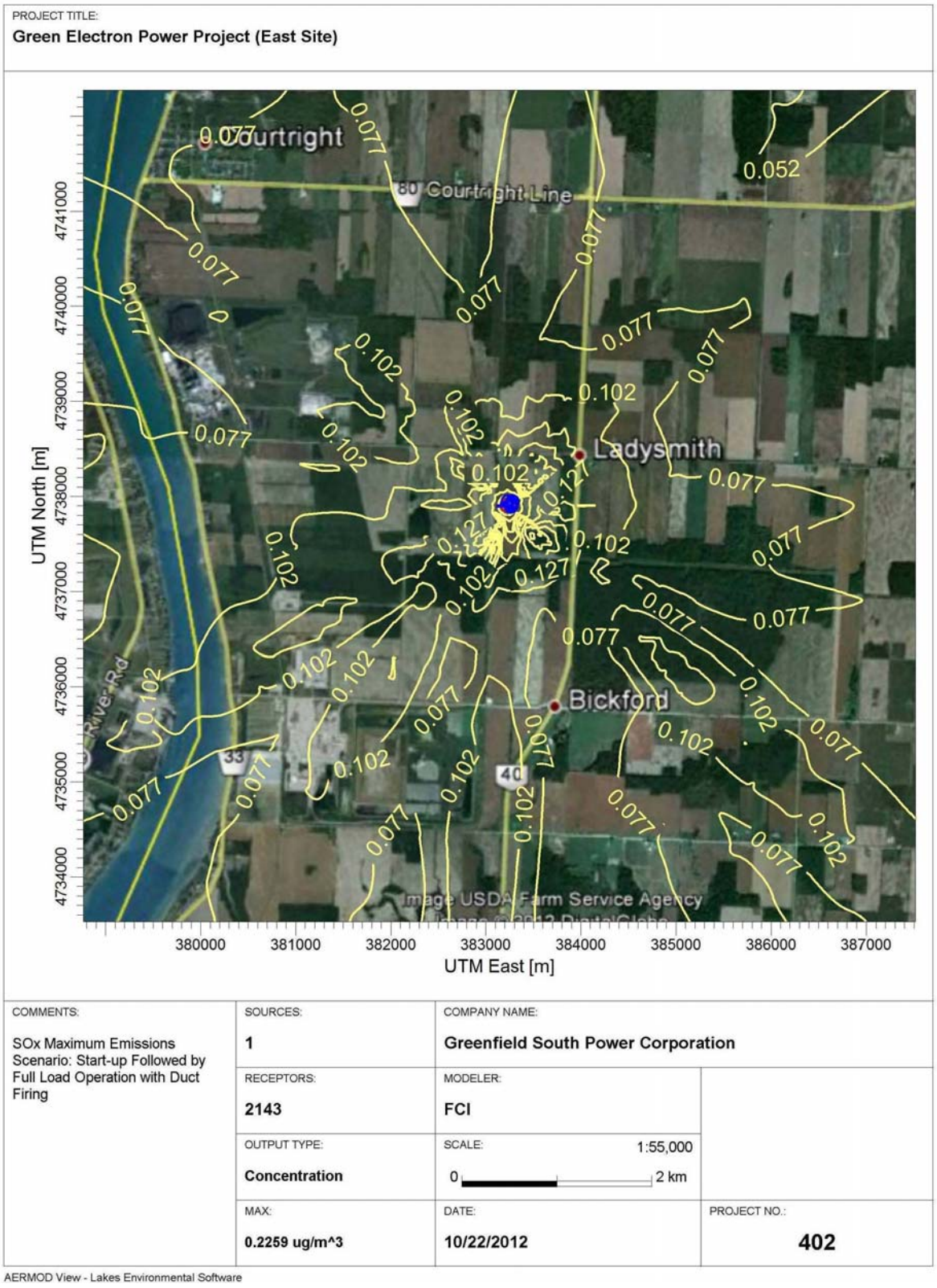


Figure 8 - PM 24 hr Maximum Concentration Isopleths

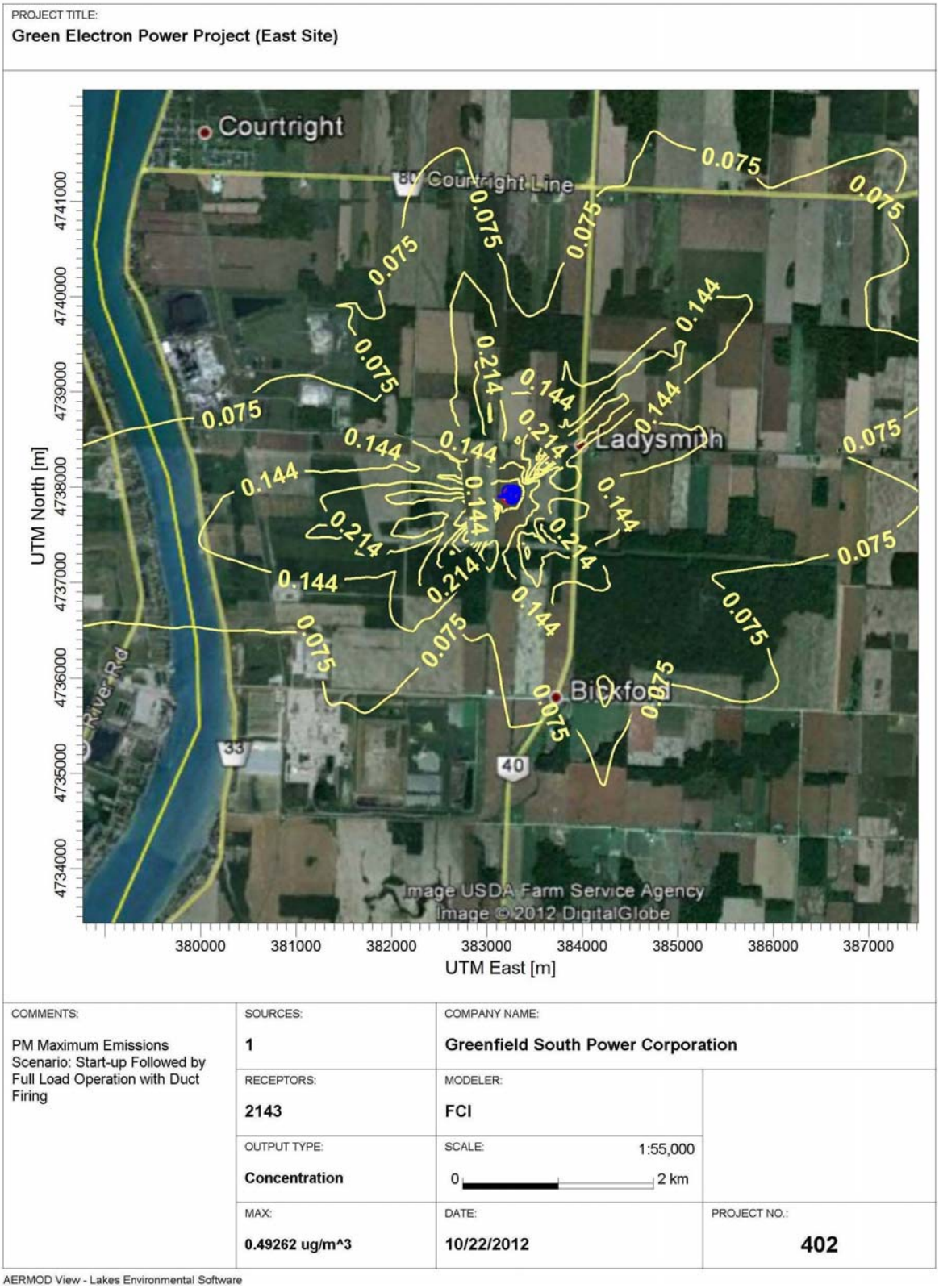
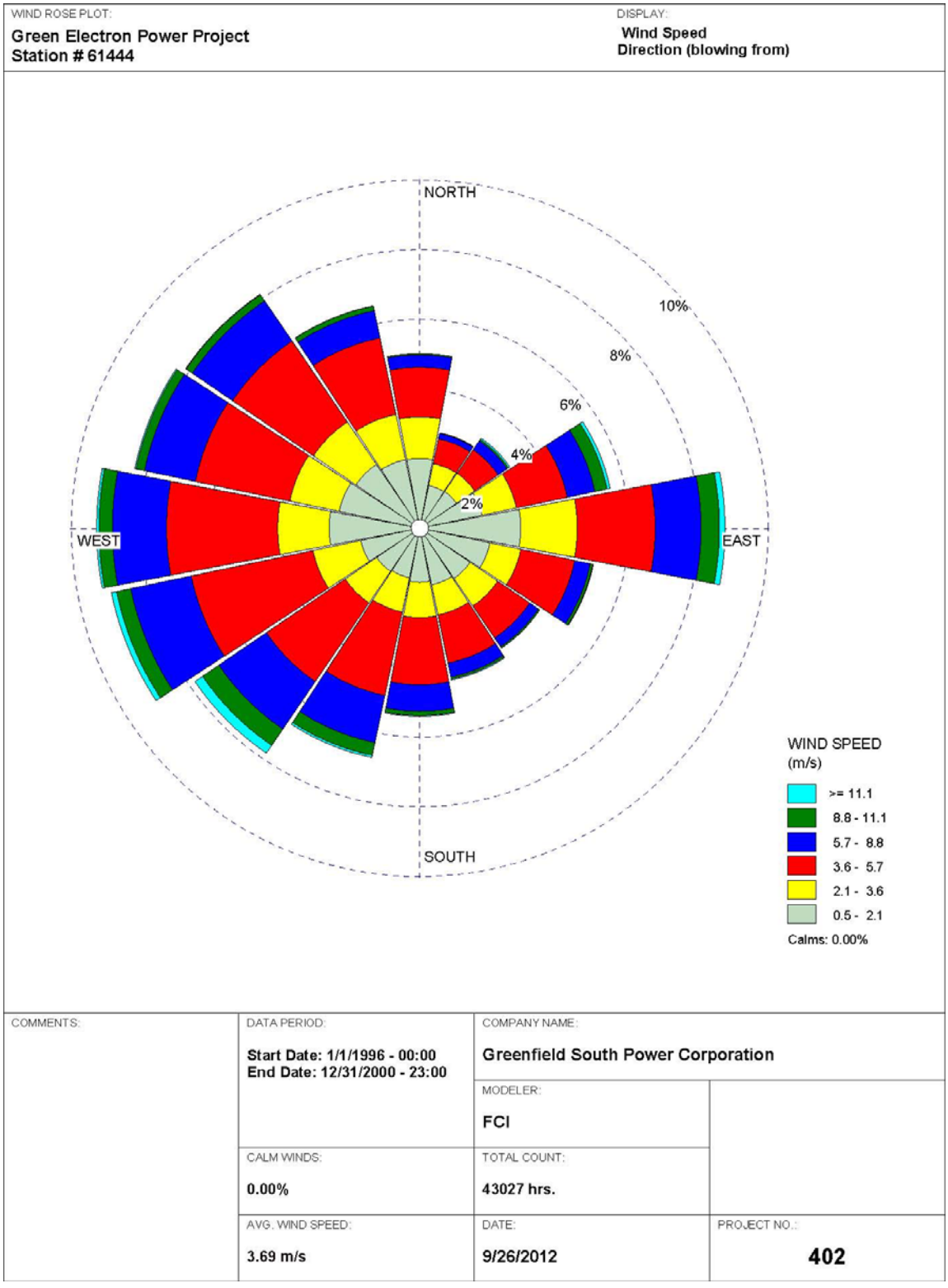


Figure 9 - Wind Rose Plot



9.5 Receptors of Interest

Tables 17 and 18 compare, for the two scenarios, full load operation and start-up followed by full load operation yielding worst-case results, the individual averaging period contaminant concentration expected from the project at each receptor of interest, against the applicable MOE POI criteria. These tables show that all MOE POI criteria will be met at all receptors of interest.

Tables 19 and 20 compare, for the two scenarios listed above yielding worst-case results, the one hour contaminant concentrations expected from the project at each receptor of interest combined with the 90th percentile local air quality data, against all applicable one hour Ambient Air Quality Criteria. These tables show that all one hour Ambient Air Quality Criteria will be met at all receptors of interest, in spite of assuming applicable worst-case emission scenarios.

Medium and long-term contaminant concentrations at receptors of interest were also calculated for those contaminants for which there are 8 hour, 24 hour and annual standards as identified in Table 4.

The results of the CO assessment at the receptors of interest are provided in Table 21 and Table 22, which show that the 8 hour AAQC for CO will be met at all receptors of interest.

The results of the 24 hr assessment of the NOx, SO_2, PM10 and PM 2.5 at each of the receptors of interest are provided in Table 23 and Table 24, which show that each applicable 24 hour AAQC will be met. Tables 23 and 24 also show that the maximum 24 hour local ambient concentration of PM2.5 is already in excess of the MOE AAQC criteria. Given the small impact on existing maximum 24 hour ambient data (about 1% addition at any receptor of interest), and the uncertainty which exists around whether natural gas fired gas turbines are net emitters of PM2.5, and that this project displaces coal fired generation with higher PM2.5 emissions, this small impact is considered acceptable. PM10 was not monitored at the MOE Sarnia air monitoring station. Following the same PM2.5 reasoning, PM10 emissions from the facility will also have a negligible impact on the airshed and is considered acceptable.

The results of the annual SO_2 assessment at the receptors of interest are provided in Table 25 and Table 26, which show that the annual AAQC for SO_2 will be met at all receptors of interest.

Table 17 - Maximum POI Concentration at the Receptors of Interest (Full Load Operation)

Receptor	Description	Contaminant Name	Flag Pole Elevation (m)	Total Facility Emission Rate [g/s]	Max. POI Concentration [µg/m^3]	Averaging Period	MOE POI Limit [µg/m^3]	Percentage of MOE POI limit
R1	Residential - 2 Storey	NO_x	0	10.40 / 4.72	16.79/1.63	1 hr / 24 hr	400 / 200	4.20%/0.81%
		CO		9.76	19.13	0.5 hr	6000	0.32%
		SOx		0.12	0.19	1 hr	690	0.028%
		PM		0.74	0.25	24 hr	120	0.21%
		NO_x	4.5	10.40 / 4.72	17.12/1.65	1 hr / 24 hr	400 / 200	4.28%/0.83%
		CO		9.76	19.51	0.5 hr	6000	0.33%
		SOx		0.12	0.20	1 hr	690	0.029%
		PM		0.74	0.26	24 hr	120	0.22%
R2	Residential - 2 Storey	NO_x	0	10.40 / 4.72	12.03/1.16	1 hr / 24 hr	400 / 200	3.01%/0.58%
		CO		9.76	13.71	0.5 hr	6000	0.23%
		SOx		0.12	0.14	1 hr	690	0.020%
		PM		0.74	0.18	24 hr	120	0.15%
		NO_x	4.5	10.40 / 4.72	12.08/1.16	1 hr / 24 hr	400 / 200	3.02%/0.58%
		CO		9.76	13.76	0.5 hr	6000	0.23%
		SOx		0.12	0.14	1 hr	690	0.020%
		PM		0.74	0.18	24 hr	120	0.15%
R3	Residential - 2 Storey	NO_x	0	10.40 / 4.72	11.22/1.06	1 hr / 24 hr	400 / 200	2.81%/0.53%
		CO		9.76	12.79	0.5 hr	6000	0.21%
		SOx		0.12	0.13	1 hr	690	0.019%
		PM		0.74	0.17	24 hr	120	0.14%
		NO_x	4.5	10.40 / 4.72	11.23/1.05	1 hr / 24 hr	400 / 200	2.81%/0.52%
		CO		9.76	12.80	0.5 hr	6000	0.21%
		SOx		0.12	0.13	1 hr	690	0.019%
		PM		0.74	0.16	24 hr	120	0.14%
R4	Residential - 2 Storey	NO_x	0	10.40 / 4.72	9.76/0.98	1 hr / 24 hr	400 / 200	2.44%/0.49%

Receptor	Description	Contaminant Name	Flag Pole Elevation (m)	Total Facility Emission Rate [g/s]	Max. POI Concentration [µg/m^3]	Averaging Period	MOE POI Limit [µg/m^3]	Percentage of MOE POI limit
		CO		9.76	11.11	0.5 hr	6000	0.19%
		SOx		0.12	0.11	1 hr	690	0.016%
		PM		0.74	0.15	24 hr	120	0.13%
		NO_x	4.5	10.40 / 4.72	9.76/0.97	1 hr / 24 hr	400 / 200	2.44%/0.48%
		CO		9.76	11.12	0.5 hr	6000	0.19%
		SOx		0.12	0.11	1 hr	690	0.016%
		PM		0.74	0.15	24 hr	120	0.13%
R5	Residential - 2 Storey	NO_x	0	10.40 / 4.72	9.20/0.71	1 hr / 24 hr	400 / 200	2.30%/0.35%
		CO		9.76	10.48	0.5 hr	6000	0.17%
		SOx		0.12	0.11	1 hr	690	0.015%
		PM		0.74	0.11	24 hr	120	0.092%
		NO_x	4.5	10.40 / 4.72	9.19/0.70	1 hr / 24 hr	400 / 200	2.30%/0.35%
		CO		9.76	10.47	0.5 hr	6000	0.17%
		SOx		0.12	0.11	1 hr	690	0.015%
		PM		0.74	0.11	24 hr	120	0.092%
R6	Residential - 2 Storey	NO_x	0	10.40 / 4.72	12.48/1.14	1 hr / 24 hr	400 / 200	3.12%/0.57%
		CO		9.76	14.22	0.5 hr	6000	0.24%
		SOx		0.12	0.14	1 hr	690	0.021%
		PM		0.74	0.18	24 hr	120	0.15%
		NO_x	4.5	10.40 / 4.72	12.51/1.14	1 hr / 24 hr	400 / 200	3.13%/0.57%
		CO		9.76	14.26	0.5 hr	6000	0.24%
		SOx		0.12	0.14	1 hr	690	0.021%
		PM		0.74	0.18	24 hr	120	0.15%

Table 18 - Maximum POI Concentration at the Receptors of Interest (Start-up followed by Full Load Operation)

Receptor	Description	Contaminant Name	Flag Pole Elevation (m)	Total Facility Emission Rate [g/s]	Max. POI Concentration [µg/m^3]	Averaging Period	MOE POI Limit [µg/m^3]	Percentage of MOE POI limit
R1	Residential - 2 Storey	NO_x	0	12.0 / 7.0	19.38/2.43	1 hr / 24 hr	400 / 200	4.84%/1.21%
		CO		18.2	35.68	0.5 hr	6000	0.59%
		SOx		0.11	0.18	1 hr	690	0.026%
		PM		0.95	0.33	24 hr	120	0.27%
		NO_x	4.5	12.0 / 7.0	19.76/2.47	1 hr / 24 hr	400 / 200	4.94%/1.23%
		CO		18.2	36.38	0.5 hr	6000	0.61%
		SOx		0.11	0.18	1 hr	690	0.026%
		PM		0.95	0.33	24 hr	120	0.27%
R2	Residential - 2 Storey	NO_x	0	12.0 / 7.0	13.88/1.73	1 hr / 24 hr	400 / 200	3.47%/0.86%
		CO		18.2	25.56	0.5 hr	6000	0.43%
		SOx		0.11	0.13	1 hr	690	0.018%
		PM		0.95	0.23	24 hr	120	0.20%
		NO_x	4.5	12.0 / 7.0	13.94/1.73	1 hr / 24 hr	400 / 200	3.48%/0.87%
		CO		18.2	25.67	0.5 hr	6000	0.43%
		SOx		0.11	0.13	1 hr	690	0.019%
		PM		0.95	0.23	24 hr	120	0.20%
R3	Residential - 2 Storey	NO_x	0	12.0 / 7.0	12.95/1.58	1 hr / 24 hr	400 / 200	3.24%/0.79%
		CO		18.2	23.85	0.5 hr	6000	0.40%
		SOx		0.11	0.12	1 hr	690	0.017%
		PM		0.95	0.21	24 hr	120	0.18%
		NO_x	4.5	12.0 / 7.0	12.96/1.56	1 hr / 24 hr	400 / 200	3.24%/0.78%
		CO		18.2	23.87	0.5 hr	6000	0.40%
		SOx		0.11	0.12	1 hr	690	0.017%
		PM		0.95	0.21	24 hr	120	0.18%

Receptor	Description	Contaminant Name	Flag Pole Elevation (m)	Total Facility Emission Rate [g/s]	Max. POI Concentration [µg/m^3]	Averaging Period	MOE POI Limit [µg/m^3]	Percentage of MOE POI limit
R4	Residential - 2 Storey	NO_x	0	12.0 / 7.0	11.26/1.46	1 hr / 24 hr	400 / 200	2.81%/0.73%
		CO		18.2	20.73	0.5 hr	6000	0.35%
		SOx		0.11	0.10	1 hr	690	0.014
		PM		0.95	0.20	24 hr	120	0.16%
		NO_x	4.5	12.0 / 7.0	11.26/1.45	1 hr / 24 hr	400 / 200	2.81%/0.72%
		CO		18.2	20.74	0.5 hr	6000	0.35%
		SOx		0.11	0.10	1 hr	690	0.015%
		PM		0.95	0.20	24 hr	120	0.16%
R5	Residential - 2 Storey	NO_x	0	12.0 / 7.0	10.61/1.05	1 hr / 24 hr	400 / 200	2.65%/0.52%
		CO		18.2	19.54	0.5 hr	6000	0.33%
		SOx		0.11	0.10	1 hr	690	0.014%
		PM		0.95	0.14	24 hr	120	0.12%
		NO_x	4.5	12.0 / 7.0	10.61/1.05	1 hr / 24 hr	400 / 200	2.64%/0.52%
		CO		18.2	19.53	0.5 hr	6000	0.33%
		SOx		0.11	0.10	1 hr	690	0.014%
		PM		0.95	0.14	24 hr	120	0.12%
R6	Residential - 2 Storey	NO_x	0	12.0 / 7.0	14.40/1.71	1 hr / 24 hr	400 / 200	3.60%/0.85%
		CO		18.2	26.51	0.5 hr	6000	0.44%
		SOx		0.11	0.13	1 hr	690	0.019%
		PM		0.95	0.23	24 hr	120	0.19%
		NO_x	4.5	12.0 / 7.0	14.44/1.70	1 hr / 24 hr	400 / 200	3.61%/0.85%
		CO		18.2	26.59	0.5 hr	6000	0.44%
		SOx		0.11	0.13	1 hr	690	0.019%
		PM		0.95	0.23	24 hr	120	0.19%