MACDON INDUSTRIES LTD.

ENVIRONMENTAL LICENCE APPLICATION

MURRAY INDUSTRIAL PARK COMPLEX

PREPARED BY

CARROLL AND ASSOCIATES LTD.

OCTOBER 2013

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1.0 INTRODUCTION AND BACKGROUND

This report is intended to provide the information required pursuant to subsection 10(3) of the Manitoba Environment Act (the Act). The report is organized according to the information requirements as set out in the Environment Act Proposal Report Guidelines – January 2011.

1.1 Background Information

MacDon Industries Ltd. (MacDon) is a family-owned, Winnipeg based manufacturer of harvesting and other agricultural equipment. MacDon began in 1949 as Killbery Industries Ltd. and pioneered the development of self-propelled windrowers. MacDon continues to play an important role in developing windrowing technology for use around the world.

The MacDonald family purchased Killbery Industries Ltd. in 1971 and renamed the company MacDon Industries Ltd. in 1975. Over the years MacDon has strengthened its leadership position by undertaking major OEM (original equipment manufacturer) contracts on behalf of some of the world's largest agriculture implement manufacturers such as Case IH, New Holland, Caterpillar and John Deere. In addition, the MacDon brand name itself is well respected and the company has become one of North America's leading farm implement manufacturers.

MacDon is headquartered in Winnipeg where it operates a state-of-the-art manufacturing facility in the Murray Industrial Park. The facility campus includes warehousing, engineering, parts, manufacturing, and administrative departments and occupies about 627,690 square feet of building floor space on over 53.9 acres of land. MacDon has other property holdings in Winnipeg outside of the industrial park that are not part of this submission. Further, MacDon (or its affiliates) has sales and parts operations in Red Deer, Alberta; Regina Saskatchewan; Kansas City, Missouri and sales offices in Greensborough, Australia and Moscow, Russia. MacDon maintains an extensive network of more than 700 dealers across Canada, the United States and Australia. MacDon products are marketed in North America, Australia, Africa, Europe, South America and China.

The Winnipeg operation currently employs about 1500 staff in a multitude of occupations ranging from engineers to assemblers to welders to clerical staff. Most staff are highly skilled and the Company invests heavily in training and research. MacDon pays close attention to employee health, safety and the environment. Their business is founded on taking principled approaches in dealing with issues.

The MacDon website located at www.macdon.com illustrates some of the products produced by MacDon Industries Ltd. and will provide the reader with some idea of the size and scale of the product line as well as providing other useful information about the company.

1.2 Site Development History

The MacDon operation in Murray Industrial Park began in 1976. MacDon was one of the first companies to locate in Murray Industrial Park and is one of the largest landholders. The aerial photo presented as Figure 1 was taken in 2011 and shows the MacDon complex (outlined in red) as it exists today.

The following is a chronology of the Murray Industrial Park site development:

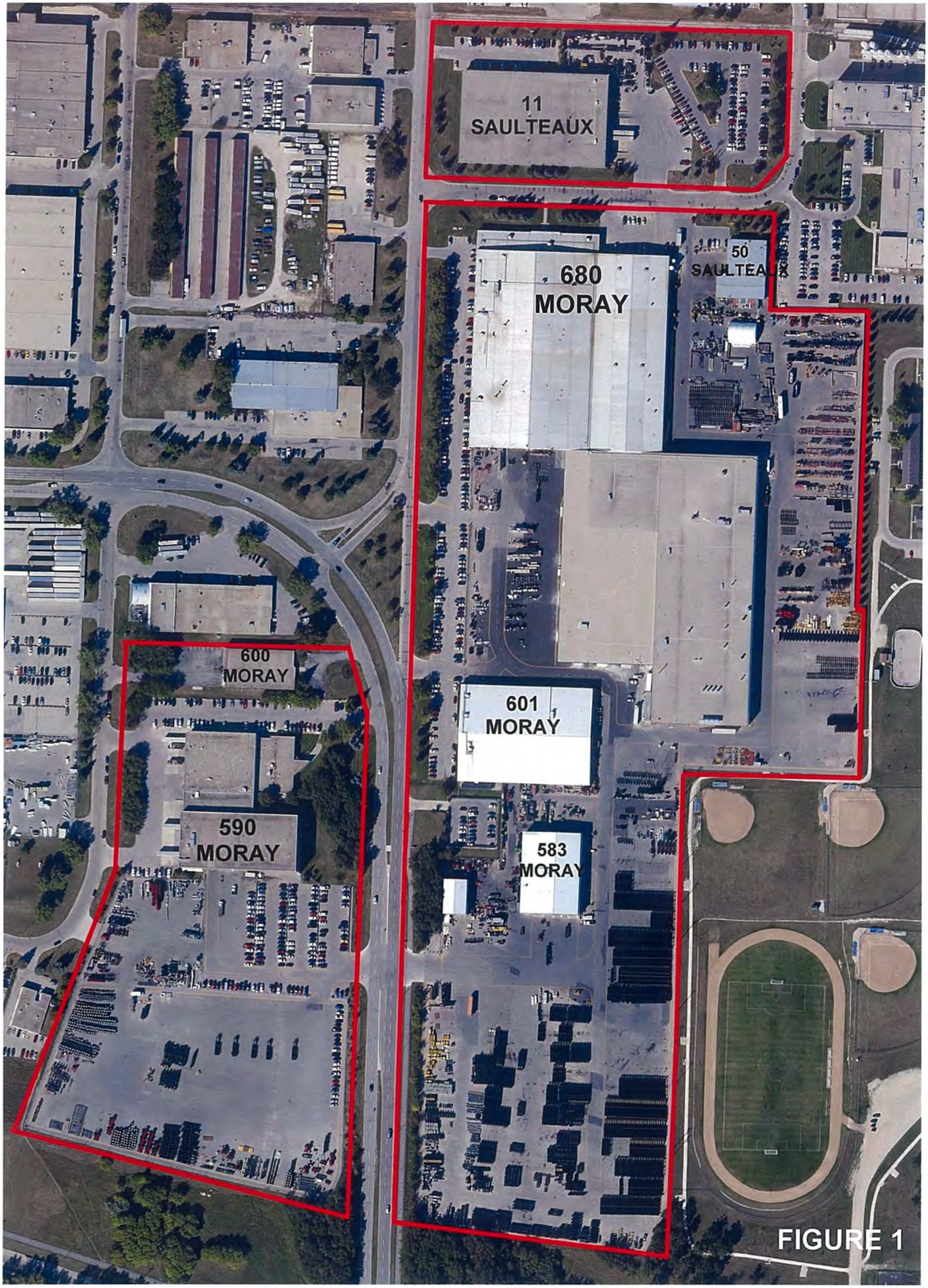
- 1975 the property at 680 Moray Street was purchased
- 1976 the building at 680 Moray Street was constructed
- 1977 the property at 601 Moray Street was purchased
- 1979 the building at 601 Moray Street was constructed
- 1983 the building at 680 Moray Street was expanded from112,100 to 174,600 sq. ft.
- 1990 the land and building at 50 Saulteaux Crescent was purchased
- 1997 the land and building at 11 Saulteaux Crescent was purchased and expanded
- 1998 the land between 601 Moray Street and Silver Ave. was purchased and developed
- 1999 the adjoining Department of National Defence (DND) property was purchased
- 2000 the Engineering Test building was constructed
- 2000 the building at 680 Moray Street was expanded from 174,600 to 310,600 sq. ft.
- 2002 the land and building at 590 Moray Street was purchased
- 2003 the adjoining property to the south of 590 Moray Street was purchased
- 2005 the north half of the above property was developed into storage and parking
- 2008 the south half of the above property was developed into storage
- 2008 the building at 601 Moray Street was expanded from 30,127 to 55,127 sq. ft.
- 2008 the building at 583 Moray Street was constructed
- 2011 the building at 680 Moray was expanded from 310,600 sq. ft. to 374,600 sq. ft.
- 2011 the building at 600 Moray was purchased and renovated

In later sections the site operation will be described and a fuller description of each of the buildings on the site will be given.

1.3 Requirement for an Environment Act Licence

The MacDon facility has operated in Murray Industrial Park since 1976. As the plant was operational prior to the promulgation of the Act in 1988 a licence to operate the facility was not required.

In December of 2009 the Environment Amendment Act was passed which tightened up environmental regulations in Manitoba. As a result MacDon Industries Ltd. sought information regarding its need to be registered. On February 10, 2010 input was solicited from Manitoba Conservation regarding the need for a licence and in a subsequent meeting our methodology for emission monitoring was laid out. Those steps have led to this unsolicited Environment Act licence submission.



11
SAULTEAUX
50
SAULTEAUX
680
MORAY
600
MORAY
601
MORAY
590
MORAY
583
MORAY

FIGURE 1

It is an interesting footnote that one of the driving reasons for the plant expansion in 2000 was to replace the liquid paint system with an environmentally friendly powder coat system. This decision was not driven by any government requirement but rather by the desire of MacDon Industries Ltd. to be environmentally friendly and at the same time produce a superior product.

2.0 DESCRIPTION OF THE DEVELOPMENT

2.1 Land Title Information

There are a multitude of land parcels that comprise the MacDon complex. In January of 2012 Barnes & Duncan Land Surveyors were engaged to conduct a parcel survey of the holdings in Murray Industrial Park. A sealed document was produced a copy of which is attached as Figure 2. This document contains the legal descriptions of the MacDon holdings in Murray Industrial Park and current title information. An enlarged copy of the title information is shown in Appendix 2. Figure 2 also shows the parcel sizes and location relative to the street system and the size and location of each building upon the parcels.

2.2 Owner of Mineral Rights

Unless otherwise specified, the owner has the mineral rights.

2.3 Description of Existing Land Use

This section will describe the surrounding land use and the land use as it relates to the MacDon site.

2.3.1 Surrounding Land Use

The aerial photograph presented as Figure 3 was taken in May 2011 and shows the MacDon complex (outlined in red) in relation to the surrounding area. The photo identifies some of the major complexes in Murray Industrial Park. Surrounding property owners and land uses are as follows:

To the north:

- Transcontinental G T Inc. LGM Graphics Division - Printer
- K-Tel International Ltd.- Product Distribution
- Nav Canada - Air Traffic Control and Airport Communications
- Air Canada – Former Aircraft Repair Facility (vacant)

To the west:

- Boeing Canada Technology - Aircraft Parts Manufacturer

BARNES & DUNCAN LAND SURVEYORS
298 FORT STREET WINNIPEG, MANITOBA R3C 1E5

CLIENT:
MacDON INDUSTRIES LTD.

MURRAY INDUSTRIAL PARK
WINNIPEG, MANITOBA

SKETCH SHOWING CERTAIN BUILDINGS LOCATED WITHIN MURRAY INDUSTRIAL PARK

OF PART OF

RIVER LOT 12
PARISH OF ST. JAMES

BEING

LOTS 11, 12 AND 13, BLOCK 2, PLAN 11955,
LOT 5, PLAN 13115,
LOTS 1, 2, AND 3, PLAN 14677,
LOT 4, PLAN 22348,
PARCELS E, F, G, AND H, PLAN 36975 AND
PARCELS A, B AND C, PLAN 40061

CITY OF WINNIPEG
MANITOBA

SCALE - 1 Inch = 100 Feet

TITLE INFORMATION:

CERTIFICATE OF TITLE: 2552299 W.L.T.O. (SEARCH DATE: NOVEMBER 8, 2011) SHOWN IN
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: LOT 1, PLAN 14677 WLTO
IN RL 12 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENT 235481, IS REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

CERTIFICATE OF TITLE: 2093378 W.L.T.O. (SEARCH DATE: NOVEMBER 8, 2011) SHOWN IN
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: FIRSTLY: PARCELS E, F, G AND H, PLAN 36975 WLTO
IN RL 12 PARISH OF ST. JAMES
SECONDLY: LOTS 2 AND 3, PLAN 14677 WLTO
IN RL 12 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENTS 235481, 2426449, 3021491 AND 3021492, ARE REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

CERTIFICATE OF TITLE: 1543494 W.L.T.O. (SEARCH DATE: NOVEMBER 8, 2011) SHOWN IN
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: LOTS 11, 12 AND 13, BLOCK 2, PLAN 11955 WLTO
EXC. ALL MINES AND MINERALS
IN RL 12 AND 13 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENTS 235482, 236104 AND 2227459 ARE REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

CERTIFICATE OF TITLE: 1150998 W.L.T.O. (SEARCH DATE: NOVEMBER 8, 2011) SHOWN IN
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: LOT 5, PLAN 13115 WLTO
EXC. ALL MINES AND MINERALS
IN RL 12 AND 13 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENTS 82-12315, 85-23806 AND 85-23807 ARE REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

CERTIFICATE OF TITLE: 1843264 W.L.T.O. (SEARCH DATE: NOVEMBER 8, 2011) SHOWN IN
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: PARCELS A, B, AND C, PLAN 40061 WLTO
EXC. OUT OF PARCELS B AND C, ALL MINES AND MINERALS
IN RL 12 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENTS 222446, 232110, 235482, 2426449, 2870501, 3531313, 85-70584 AND 85-58918 ARE REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

CERTIFICATE OF TITLE: 1764865/1 W.L.T.O. (SEARCH DATE: JANUARY 20, 2012) SHOWN IN
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: SP LOT 4, PLAN 22348 WLTO
EXC. OUT OF PARCELS B AND C, ALL MINES AND MINERALS
IN RL 12 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENTS 232110/1 AND 235482/1 ARE REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

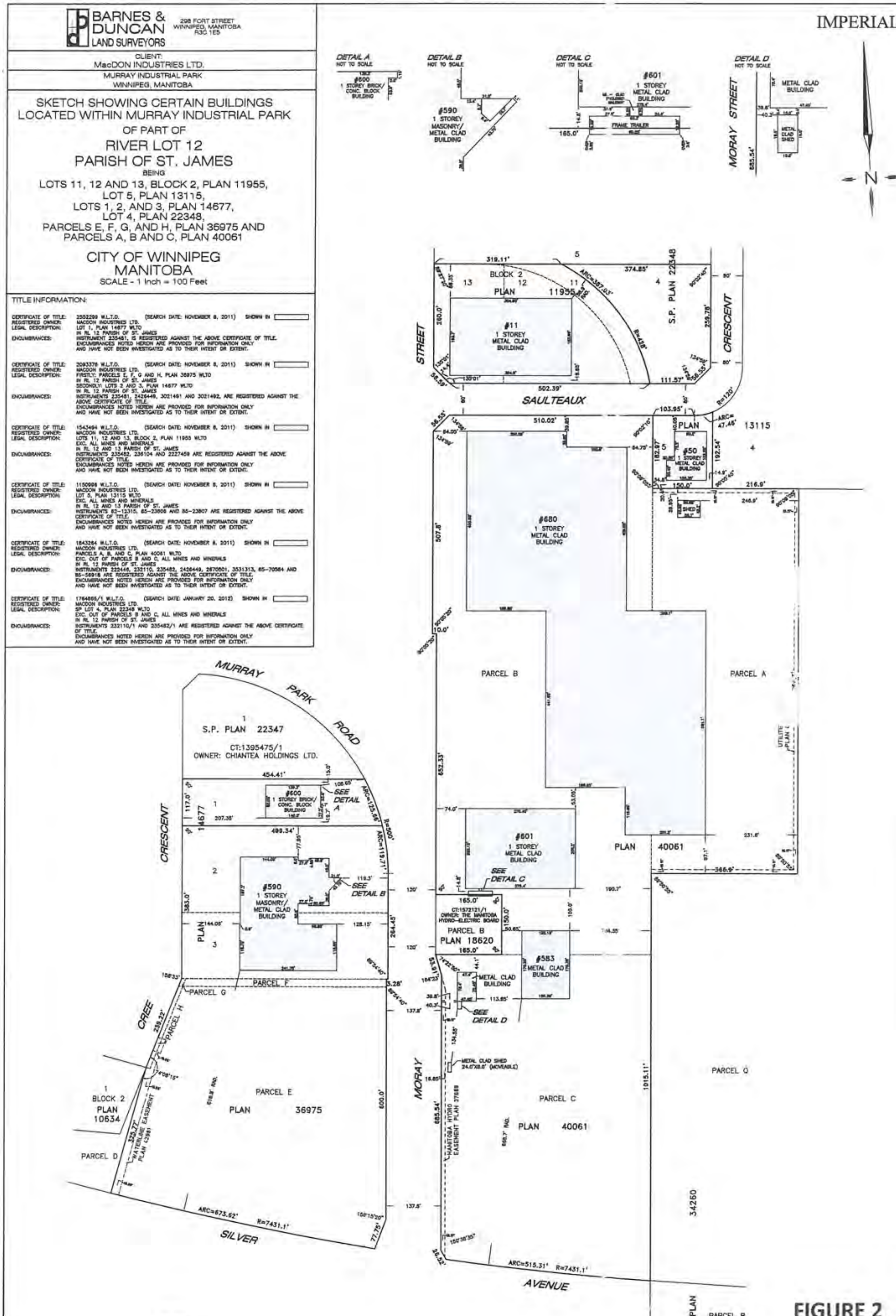


FIGURE 2

NOTES

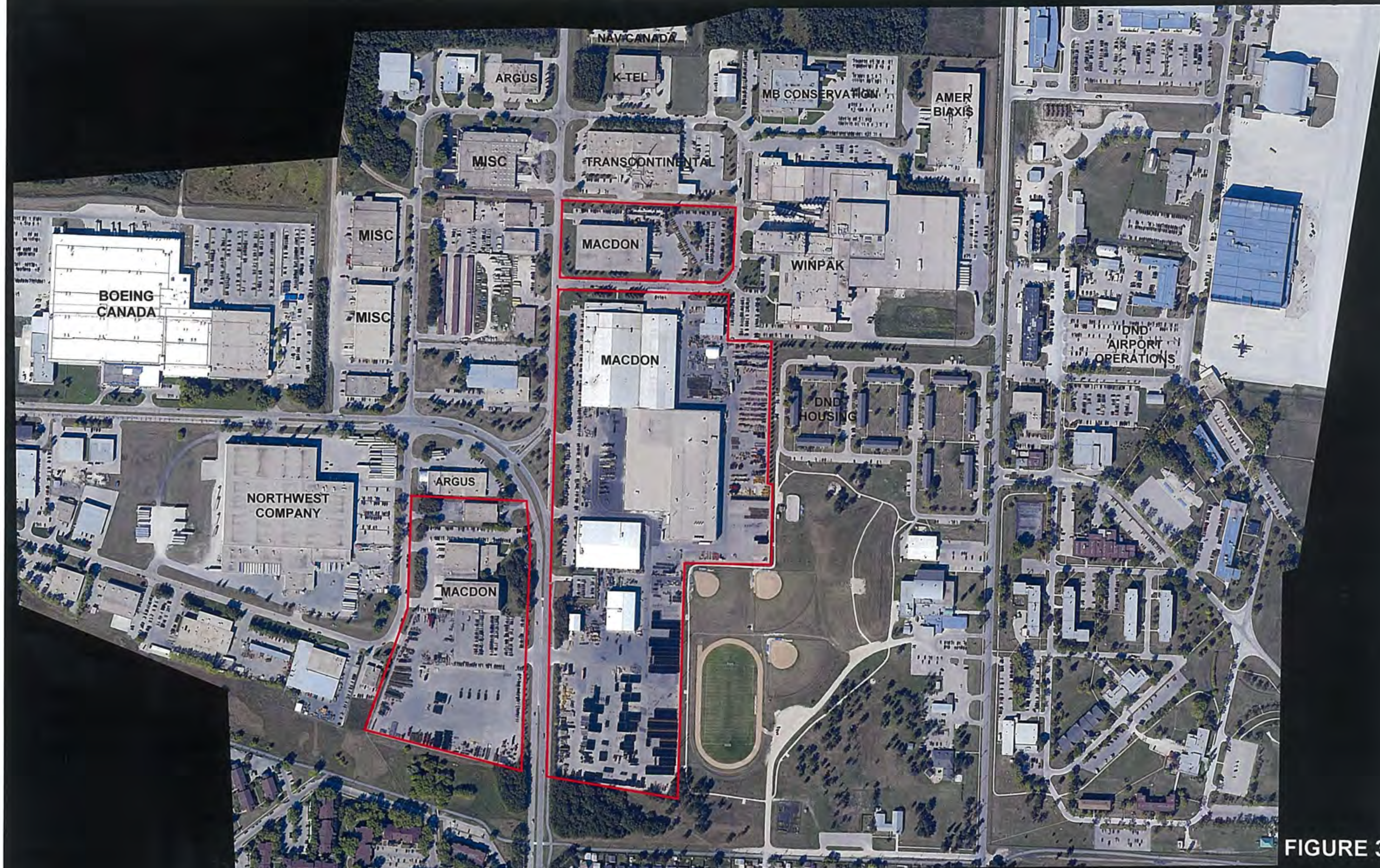

NAV CANADA
ARGUS
K-TEL
MB CONSERVATION
AMER BIAXIS
MISC
TRANSCONTINENTAL
MACDON
WINPAK
MISC
BOEING CANADA
MISC
MACDON
DND AIRPORT OPERATIONS
DND HOUSING
ARGUS
NORTHWEST COMPANY
MACDON

FIGURE 3

- The North West Company - Retail Service Centre
- Argus Industries - Manufacturer of Moulded Rubber and Die Cut Products
- Miscellaneous Small Manufacturing, Retail and Distribution Operations

To the south:

- Open Space
- Single and Multifamily Residential

To the east:

- Department of National Defence - Open Space, Military Housing, Airport Operations
- Winpak- Manufacturer of Packaging
- American Biaxis- Manufacturer of Packaging
- Manitoba Conservation - Government Offices

2.3.2 MacDon Site Land Use

MacDon Industries Ltd. manufactures agricultural equipment at this location. Products manufactured include self-propelled and pull type windrowers, harvest headers and auger headers.

All MacDon products are built at the Moray Street complex. In addition to the manufacturing use the shipping, parts storage, engineering and research and various office functions operate from this location. The descriptions below will indicate the present site use starting from the south. Refer to Figure 2 for locations.

- Open space on Parcel C of the east site is use for storage of finished product prior to shipping. The entire site is paved, fenced and monitored by closed circuit television cameras and 24/7 security patrols. The total storage area measures approximately 26 acres. The steel frame metal clad building near the south gate is a building with a floor plate of 3,400 sq. ft. that is used for product testing by the engineering and research group. All shipping traffic enters and leaves the site via motorized gates from a large access off Moray Street. Traffic through this gate is controlled by security.
- The building at 583 Moray Street is a steel frame metal building with a floor plate of 20,400 sq. ft. The building has about 1,920 sq. ft. of office space and lunchroom and 18,480 sq. ft. of shop floor space used for parts storage, final assembly audits, product assembly and product shipping preparation.
- The building at 601 Moray Street is a steel frame metal building with a floor plate of 55,127 sq. ft. The building has about 11,154 sq. ft. of office, lunch and meeting space (including mezzanine) and 43,973 sq. ft. of shop floor space used for building and servicing prototype equipment.
- The building at 590 Moray Street is a steel frame building located on the west side of Moray. Tractor assembly occurs in this building. The building has 45,937 sq. ft. of product

assembly and parts storage area and 17,900 sq. ft. of office/classroom (including mezzanine) on 13 acres of land. Parking lots are located to the north and south and equipment storage takes place on the south in a fenced enclosure.

- The building at 600 Moray Street (immediately north of 590 Moray) is a one-story brick and concrete block building with a floor plate of 11,369 sq. ft. The building has about 6,170 sq. ft. of office, lunch and meeting space and the remainder is storage space.
- The building at 680 Moray Street is the main manufacturing facility. The manufacturing floor plate occupies 374,600 sq. ft. and is a combination steel frame metal and steel frame precast concrete panel/steel panel building. The building has approximately 20,000 sq. ft. of office component (including mezzanines) and cafeteria, the remainder is parts manufacturing, product coating and product assembly space.
- The building at 50 Saulteaux Crescent is a steel framed metal clad quality control and maintenance building. The floor plate occupies 10,900 sq. ft. The building houses sophisticated measurement equipment for quality control purposes, maintenance shop floor space and an office component, lunch and meeting room.
- The building at 11 Saulteaux Crescent houses the purchasing and parts warehouse functions. The building is a steel framed metal clad building with a floor plate of 59,000 sq. ft. of which 59,000 sq. ft. is a parts warehouse and 7,800 sq. ft. (including mezzanine) is office component. There is an exterior, fenced parts storage compound on the north side of the building at this location. Staff parking lots are located to the north and east.

2.4 Land Use Designation

The MacDon complex is located in Murray Industrial Park and as could be expected the zoning for the area reflects an industrial use with zoning being M2.

The Department of National Defence (DND) federal lands to the east of the MacDon site including the military housing component are zoned M2. The residential areas to the south of the Silver Avenue corridor right of way are zoned either RMF-S or R1-M.

MacDon has sought and received zoning variances related to set back distances and parking allocations. The zoning variance details are outlined in City of Winnipeg zoning variances DAV 1065/87, DAV 707/98C, DAV 349/99C, DAV 05-131639/C and DAV 148512A/2006C.

2.5 Previous Studies and Activities

All of the site development that has been carried out, as itemized in Section 1.2, have been done by reputable Winnipeg based engineers and contractors. The appropriate permits have been obtained and inspections to ensure building, fire and other code compliance have been conducted by the City of Winnipeg. In recent years due diligence respecting environmental issues has become important and accordingly MacDon has had the following reports prepared.

- An Assessment of Environmental Risk report prepared in 1993 for the Royal Bank as part of due diligence regarding environmental compliance. This report covered employee health and safety practices, hazardous waste and dangerous goods handling and emergency response as well as other topics.

- Wardrop Engineering Inc.- Phase I Environmental Site Assessment and Preliminary Structural Assessment - 11 Saulteaux Crescent, Winnipeg, Manitoba. February 1997. This report reviewed the history of the subject property and found no need for a Phase II assessment based on the former site use.

- Wardrop Engineering Inc.- Environmental Assessment of CFB Winnipeg Proposed Property Subdivision- Phase I and Phase II Site Assessment. September 1998. This report reviewed the history of the subject property and found that a Phase II assessment was called for because of the existence of a former landfill site on the adjacent DND property. The landfill site was included in the City of Winnipeg landfill gas-monitoring program and it was concluded by the City of Winnipeg that the site posed no risk for methane or leachate migration. The Phase II site assessment also found no indication of any significant subsurface methane or leachate impacts on any of the surrounding property.

- AMEC Earth and Environmental Limited - Phase I Environmental Site Assessment - 590 Moray Street. July 2003. This report reviewed the history of the subject property and found no need for a Phase II assessment based on the former site use.

- AMEC Earth and Environmental Limited - Phase I Environmental Site Assessment - Vacant Property Northwest Corner of Moray Street and Silver Avenue. October 2003. This report reviewed the history of the subject property and found no need for a Phase II assessment based on the former site use.

- AMEC Earth and Environmental Limited - Phase I Environmental Site Assessment - 600 Moray Street. July 2011. This report reviewed the history of the subject property and found no need for a Phase II assessment based on the former site use.

MacDon takes the health and safety of its employees very seriously and works with the employee association closely. Over the years MacDon has commissioned numerous industrial hygiene studies and is currently awaiting the results of the most recent survey. The current respiratory protection program in the Welding Department is being up-dated to better reflect the legislative changes to allowable exposure limits of welding fume. Annual Hearing evaluations are done for all staff working in production areas where potential exposure to higher levels of noise exists. A baseline hearing test is conducted for all new hires. An annual report is sent to the Provincial Regulator. This complies with the legislated requirements of Section 12 of the Manitoba Workplace Health and Safety Act.

Finally, appropriate public notification for the zoning variances set out in Section 2.4 took place and MacDon representatives appeared at the various public forums to supply information to the City and the public. In addition, MacDon worked with the base command and the base Residents Community Council during the planning and construction phases of the plant expansion carried out in 2000.

2.6 Description of Development Operation

In Section 2.3.2 a description of the existing site was given which outlined the buildings on the site, their type of construction and use. In this section a description of the operation will be presented.

The production facility generally operates 24 hours per day 5 days per week with occasional Saturday shifts as production needs dictate. A contracted security company provides two guards on site 24 hours a day, 7 days a week, all year round. One guard is in the control center at all times monitoring the closed circuit cameras, burglar and intrusion alarms and smoke/fire panels. The guards control all after-hours access to the site and conduct security patrols throughout the entire campus hourly.

The hours of operation are generally as follows:

- Office and technical - 8:00 - 16:30 weekdays
- Shipping and receiving - 7:00 - 15:00 weekdays
- Maintenance – 24 hours per day 5 days per week (weekend overtime shifts are routine)
- Manufacturing - 6:00 - 15:30 weekdays day shift (staggered start/finish times)
  15:30 - 23:30 weekdays evening shift
  23:30 - 7:30 night shift
  Occasional Saturday overtime shifts as production warrants

2.6.1 Process Overview

The agricultural products produced are made from a combination of on-site manufactured and purchased components. The on-site manufactured components are generally fabricated from sheet steel, steel tubing or bar steel. These materials are cut, bent, rolled, machined or otherwise shaped into component parts for fabrication into the end product. Subcontractors fabricate some component parts off site. In addition, it is not practical to create all the component parts and therefore some are purchased. Examples of purchased components are diesel engines, drive trains, electric and hydraulic drives/motors, tires, rims, non-metallic polymer tractor engine covers and roofs, windshields, hardware etc. These materials are all combined into the final products as outlined below.

Figure 4 is a diagram that shows the layout of the 680 Moray manufacturing facility and depicts where the major operations described below take place in that facility.

2.6.2 Raw Material Storage

As indicated earlier, sheet, tube and bar steel are covered from the elements and are stored outdoors on wooden pallets and inside a Quonset tent. All other steel products are stored indoors. In addition, most of the purchased components are also stored indoors to protect them from the elements and also because of their high value. Some components such as tires, rims and

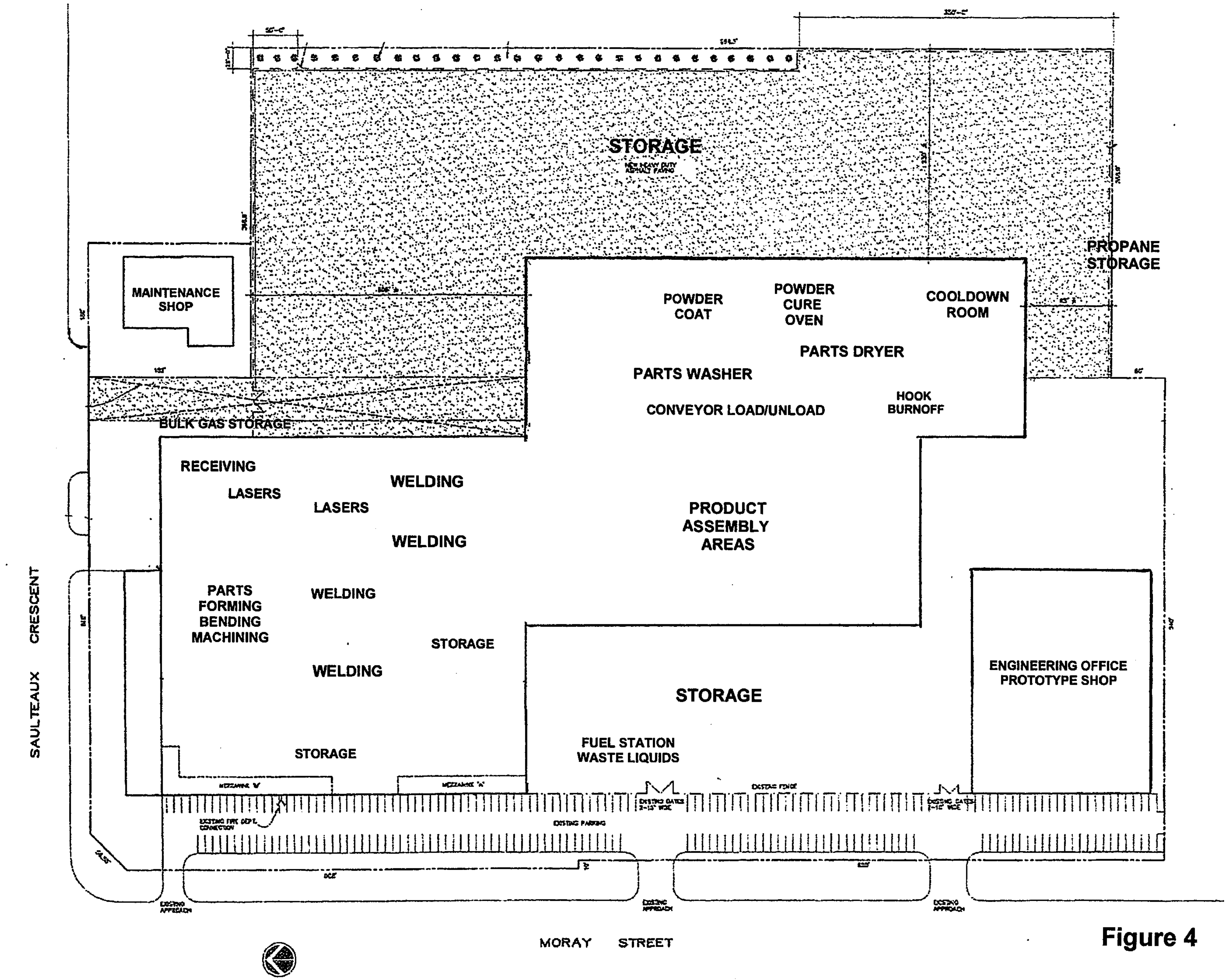

STORAGE
PROPANE STORAGE
MAINTENANCE SHOP
POWDER COAT
POWDER CURE OVEN
COOLDOWN ROOM
PARTS DRYER
PARTS WASHER
CONVEYOR LOAD/UNLOAD
HOOK BURNOFF
BULK GAS STORAGE
RECEIVING
LASERS
LASERS
WELDING
WELDING
PRODUCT ASSEMBLY AREAS
PARTS FORMING BENDING MACHINING
WELDING
STORAGE
WELDING
STORAGE
ENGINEERING OFFICE PROTOTYPE SHOP
STORAGE
FUEL STATION WASTE LIQUIDS
SAULTEAUX CRESCENT
MORAY STREET

Figure 4

occasionally polymer components are stored outdoors. For the most part, just in time parts inventory is used. For example, tractor engines, tires etc. are only stored when production runs of those products are taking place. Similarly, steel parts for products are fabricated in anticipation of specific product runs. In this way the amount of stored material is kept low.

Steel and other input material receiving takes place weekdays at the 2 overhead doors facing onto Saulteaux Crescent. Some material also enters the yard via the gate off Saulteaux Crescent. All other items to be received would enter the site via the Moray Street entrance. Deliveries are also received at the parts warehouse at 11 Saulteaux Crescent. It is estimated that on average 36 large trucks or semi-trailers trucks per day are received and unloaded although this can vary somewhat from season to season with the range being from 25 to 50 trucks per day. Forklift truck traffic is associated with the receiving operation. All receiving takes place between the hours of 7:00 to 17:30.

2.6.3 Parts Production

The plant has 4 laser cutters, 2-4500 watt, 1-4000 watt and 1-2500 watt, which generally operate 24 hours per day 5 days per week. Laser cutting sometimes takes place on Saturday in order to keep up with production demands. The two new (2012) 4500 watt machines are computer controlled and auto fed from a steel plate stacker and the laser fume is filtered with the return air vented into the building space. The two older machines are manually fed. The sheet carbon steel is transported by forklift from the steel storage area to the laser cutting machines for cutting to size. The older lasers have power exhaust vents operating at 2120 cfm. The vents are exhausted to the atmosphere. The going forward plan is to replace these units with new larger capacity automated systems and filtered vents in the near future. The cut parts are then transported to various presses and punches where they are shaped into their final form. Some grinding to remove rough edges and burrs takes place at this stage.

Oxygen, nitrogen, and argon gases are used to operate the laser cutters and the welding guns. These gases are supplied from outside bulk storage tanks located on the east side of the facility (see Figure 4). Nitrogen, acetylene and migmix gold (a welding mixture of argon oxygen and carbon dioxide) are supplied in standard cylinders.

Bar steel is transported to the machine shop area where it is cut to length and formed into precision parts such as shafts by means of lathes, milling or grinding machines most of which are computer controlled. Diluted (20:1) machining coolant is used during this processing operation to reduce wear on cutting surfaces. Approximately 500 litres/month of Master Chemical Corp. E206 coolant is consumed. The spent coolant is collected in a 2000 litre storage tank that is pumped out 4 to 6 times per year by a licenced waste hauler for disposal.

Scrap steel and steel turnings from the parts production operation are placed in bins for collection and recycling by an industrial metal recycling contractor.

2.6.4 Component Fabrication

The raw parts are fabricated into the component parts of the final product. This operation chiefly involves welding the raw parts together. The final component parts can be very large, up to 45 feet in length and heavy, up to 3000 pounds in weight. Welding is done either manually or by robotic welder. Metal inert gas (MIG) welding using 95% argon and 5% oxygen is employed. The oxygen and argon gases required for welding are supplied from outside bulk storage tanks. Copper coated welding wire is chiefly used.

There are 87 manual and robotic welding stations. Not all welding stations operate at the same time. Their use depends on the type of component parts being fabricated at the time. Each of the welding stations is connected to a fume hood system for collection of welding smoke from the arc. There are 2 central welding exhaust fans that are each rated at 12,000 cfm and one vent fan rated at 5600 cfm. These fans vent 36 of the 87 welding stations. The welding smoke captured from these stations is vented to the atmosphere.

As part of its on-going environmental improvement program MacDon has been converting from atmospheric venting to high purity filtering of welding smoke. As a result the majority (51) of the welding stations are connected to Statiflex 600 MS high purity filtering systems which meet ISO 8573-1 Class 6 air quality criteria with a filter efficiency of 99.6%. The air from these systems is re-circulated into the building thus reducing atmospheric emissions and conserving energy.

There are also 12 -735 cfm Lincoln Mobiflex 400 welding smoke collectors/filters with smoke extraction arms that are used to capture and filter smoke from welding operations that take place away from the welding stations. The Lincoln Mobiflex units are also used to capture and filter fumes from 2 - 1200 watt plasma cutters that are used in the fabrication process. In addition to the foregoing vent fans there are also three 10,700 cfm building exhaust fans that remove fugitive emissions that may be present in the indoor air environment. Some grinding of welds to provide a smooth final surface takes place in this phase of the operation.

Welding of alloys such as stainless steel, which contains toxic metals such as chromium, does not take place.

2.6.5 Product Painting and Powder Coating

2.6.5.1 Liquid Paint System

Prior to the completion of the powder coating facility in 2000 all product painting was done by liquid paint application. This has now changed and all of the in house coating is by powder coat application. Liquid paint is only used for touch up of damaged components that have been assembled and cannot be re-coated with powder coat.

The liquid paint system consists of a small painting booth equipped with a wet scrubber system to capture over spray. The scrubbing agent is water containing a capture agent called Poly D Tac that is recycled within the system and topped up as necessary. The booth is drained annually with the water going to sewer and the captured over spray, in the form of a paint sludge, being placed into a drum for disposal by a licenced hazardous waste hauler. It is estimated that one half drum of sludge is produced annually.

Liquid paint is received in 16 ounce spray bombs, 18.9 litre pails and 200 litre drums. Paint is stored in fire proof cabinets in the paint area and is held in limited quantities. Solvents (xylene and methyl ethyl ketone) are used to clean spray guns and equipment and are also stored in fire proof cabinets in the paint area and held in limited quantities. Waste solvent (1 or 2 - 200 litre drums) are kept in fire proof cabinets until it is picked up by a licenced hazardous waste hauler for disposal. Empty drums are stored in a designated outdoor storage area pending pickup by a registered Hazmat recycling company. The paint booth has 2 - 18,000 cfm exhaust fans vented to the atmosphere. Spray painters wear proper respiratory equipment.

The foregoing described liquid paint system is presently being replaced with a new state of the art paint booth. Exact details of the new system are not available at this time as the system is being tendered and there are multiple bidders. The new system will be in place by the fall of 2013.

2.6.5.2 Powder Coat System

The powder coat system is located within a 112,000 sq. ft. area on the east side of the plant. The unpainted parts are loaded onto an overhead conveyor system at one of three loading/unloading stations. The parts pass through a 5 stage washer that uses a warm (120^0 F.) phosphoric acid based cleaner to remove mill oil and other soil to prepare the steel for powder coating. Stage 1 is maintained at pH 5.1 to 5.4 while stage 3 is at approximately pH 4.8 to 5.1. The phosphoric acid/cleaner is received in refillable 300 gal bulk storage totes and 45 gallon drums. The chemical is fed directly from these vessels into holding tanks in the system.

The washer filters and recycles the acid cleaner from 5610 and 3510 gallon holding tanks. The system is neutralized and drained every 4 to 6 months and recharged. Filter sludge and sludge accumulating in the wash water holding tanks are removed by licensed hazardous waste removal trucks.

Stages 2, 4 and 5 are clean water rinse stages. The 18 gallon per minute rinse water from the system is collected in a floor trench and is pumped into a 6400 gallon holding tank. From there it is pumped into a 4000 gallon tank where it is batch neutralized to pH 5.5 to 8.0 before being pump discharged to the municipal sanitary sewer. The washer has exhaust fans at each end to prevent excess vapour build-up in the building. These fans are each rated at 14,700 cfm and are vented to the atmosphere. The hot water heating system for the wash water is gas fired and consists of 4 high efficiency hot water heaters (8.837 Million BTU) that are vented via 12" duct.

The washed parts proceed into a dehumidification unit to thoroughly dry the parts prior to powder coat application. The powder coating is applied in one of 3 booths that are located in a climatically controlled environmental room within the plant. This air conditioned humidity controlled room re-circulates the room air after filtration through filter banks. Two 16,000 cfm roof top mounted air conditioners are used to cool this area of the plant. At any one time two powder coat lines can operate simultaneously, the second and third booths can move on and off line to facilitate colour changes.

Powder is received in 110, 125, and 600 kg containers that are held in a climatically controlled storage room. The powder is fed into hoppers on the booths for feeding to the computer controlled automated powder coat guns. The guns produce a mist of powder in the booth that adheres to the steel parts by electrostatic charge. The excess powder in the booths is recycled for reuse through an elaborate filtration system. The booths themselves are under negative pressure so that no powder escapes. Within each booth are up to four manual touch up stations. The powder coat appliers wear body suits and hoods that are supplied with purified breathable air. The booths are also equipped with spark detection systems that will shut down the booth if a spark is detected anywhere within the booth. There is also a small booth within the powder coat room that is used for powder gun clean up and touch up work. An industrial central vacuum system is in place to clean up the powder booths and environmental room. Any waste powder created, which has too many fines to be reused further, is placed in drums and sent to landfill.

The coated parts proceed into a 2 stage curing process. The first stage is a rapid cure in a direct gas fired infrared oven that is held at a temperature of 600^0 F. The second stage is a longer cure in a direct gas fired convection oven where temperatures are controlled at up to 400^0 F. The conveyor system can be programmed to hold products for varying time periods in the cure oven. The cure oven has exhaust fans at each end to remove excess heat from the building. These fans are rated at 9,000 cfm for the north end fan and 4,800 cfm for the south end fan. These fans are vented to the atmosphere. The oven has a vent to the atmosphere that is rated at 10,000 cfm. In addition, the oven has a purging vent to the atmosphere that is rated at 5,000 cfm that is only used for a short time during oven start up. There are 2 large fans, each rated at 30,000 cfm, in the building ceiling space that are used to vent heat from the building in the summer.

In order for the powder coating to adhere to the bare metal by electrostatic charge the product must be properly grounded. Because the racks and hooks that carry the parts through the processing also become powder coated it is necessary to periodically remove the powder coat from these items. This is accomplished in a gas fired burn off oven that operates at 825^0 F. The oven has an afterburner on the gravity flue that operates at 1600^0 F. The high temperatures in the oven cause the powder to break down to ash. The inert ash is rinsed off in a closed water wash system. The ash in the recycled water is filtered out by a 10 micron continuous filter and the filter paper is taken to landfill. Any residual ash sludge accumulating in this system is removed on an monthly basis by a licenced waste hauler and sent to a City treatment facility.

From the curing oven the parts pass through a cool down room where large fans move ambient air over the parts to cool them so that they can be unloaded. There are 4 - 30,000 cfm intake and 4 - 31,000 cfm exhaust fans that move the air in and out of the cool down area. Powder coated parts are stored outdoors awaiting assembly.

2.6.6 Product Assembly

Prior to the powder coat system operation products were first assembled and then painted. Because the high oven temperatures would negatively impact many component parts the products are now powder coated and then assembled. The fabricated and purchased parts are all brought together during this operation to form the final product. Products are assembled in the 680 and 590 Moray buildings.

The products are filled with engine oil, hydraulic oil, gear oil, antifreeze and air conditioner refrigerant (SUVA 134a) as required during this operation. Engine oil and hydraulic oil are held in 330 gallon refillable bulk storage totes, gear oil is received in 55 gallon drums, antifreeze is received in 330 gallon refillable bulk storage totes and air conditioner refrigerant is received in 125 pound reusable cylinders. There is also some use of solvents during this phase of the operation. Empty drums are stored in an outdoor enclosure for pickup and reuse by the product supplier. Rags contaminated with oils and hydrocarbons are kept outdoors in a Hazmat storage container and picked up weekly by a registered Hazmat recycling company.

Glues are used in the assembly of tractor cabs to mould together different sections. Until 2008 this operation was done on site but has since been contracted out so that no VOC emission from this gluing process takes place on site. Some gluing of upholstery headliners takes place in a confined ventilated area, VOC emissions from this source are considered minor.

All products are thoroughly inspected and tested after assembly. Tractor engines are run and the exhaust gases are collected and vented by powered vents rated at 1200 cfm.

2.6.7 Product Storage and Shipping

The finished products are stored outdoors in the 26 acre paved, fenced, drained, illuminated, monitored storage area. Some tractor storage takes place in the 5.5 acre compound on the west side of Moray adjacent to the production facility. All products are shipped by truck including containers that are packed for overseas shipment. All truck traffic enters and leaves via the controlled gate on Moray Street. Generally, trucks are loaded in the south end of the shipping yard. On average approximately 25 semi-trailer trucks per day are loaded and shipped although this can vary somewhat from season to season with the range being from 10 to 40 trucks per day. Forklift truck traffic is associated with the shipping operation. Shipping hours are from 7:00 to 15:00 daily with occasional Saturday shipping.

2.6.8 Engineering and Research and Development

The engineering and research and development operation is where prototype and field test equipment are assembled and serviced. The operations that take place are similar to those that would be expected in a well-equipped machine shop operation. Machining operations annually consume less than 200 gallons of Master Chemical Corp. E206 coolant and welding operations consume less than 5000 pounds of welding wire. There are three 3500 cfm central exhaust systems that are used to vent diesel exhaust and other fumes from inside the building. A 4000 watt laser cutter is vented by a 2120 cfm fan. This laser is only run to cut parts as required and is not a production machine. Waste oils, solvents, oily rags etc. are all consolidated with the appropriate waste streams discussed above.

2.7 Storage of Gasoline and Associated Products

A 2500 litre horizontal aboveground diesel fuel storage tank is located on the west side of the manufacturing facility (see Figure 4). The tank has an integral secondary containment tank. This tank was installed in 1992 and meets ULC Standard S603.1(ULC-S601-93).

A 2500 litre vertical aboveground gasoline storage tank is located on the west side of the manufacturing facility (see Figure 4). The tank has an integral secondary containment tank. This tank was installed in August 2002 and meets ULC/ORD - C142.22.

A 2500 litre vertical aboveground diesel storage tank is located on the south side of the tractor assembly facility at 590 Moray. The tank has an integral secondary containment tank. This tank was installed in August 2009 and meets ULC/ORD - C142.22. In addition, on the south side is an outdoor 110% containment facility for the storage of motor oil and ethylene glycol used in the tractor assembly operation. A new storage/containment facility is under construction and will be operational in the fall of 2013.

A 2000 litre horizontal aboveground diesel fuel storage tank is located on the east side of the engineering test facility (see Figure 4). The tank has an integral secondary containment tank. This tank was installed in 2010 and meets ULC Standard S603.1(ULC-S601-93).

A 3000 gallon underground gasoline storage tank was located at the northeast corner of the engineering/research building. This tank was installed in 1983 and was removed in August 2002 for environmental concern reasons. The sacrificial anodes were intact and had been recently tested. A licenced contractor decommissioned the tank as per Manitoba Conservation guidelines and appropriate inspections took place. Soil tests confirmed that there was no leakage from this tank.

Waste oils from assembly and maintenance operations are stored in an outdoor 1500 litre double wall polyethylene tank with 110% secondary containment on the west side of the manufacturing facility (see Figure 4). This tank complies with EPA standard CFR 40-279.22 for used oil storage containers. A waste oil contractor pumps the tank out 3 to 4 times per year and the oil is recycled. The oily rag storage is located in the same area.

Approximately 50 - 30 pound propane tanks, used for fork lift power, are stored in a covered caged outdoor containment area on the south side of the manufacturing facility (see Figure 4). Used or spent tanks are exchanged on a weekly basis by the supplier.

2.8 Description of Potential Impacts

In the foregoing sections we have described the operations and outlined the points where various chemicals (liquids and gases) are used. We have also described the physical activities that take place on the site. In this section we will quantify the emissions to the environment from our operations and describe the potential environmental impact of our emissions and operations.

2.8.1 Type, Quantity and Concentration of Pollutants Released to the Air

2.8.1.1 Community Exposure

The potential atmospheric emissions consist of metals from welding and cutting operations, VOCs from powder coating and hook burning operations and particulates and gases from hook burning operations.

Elias Occupational Hygiene Consultants Inc. was engaged to complete a review of the atmospheric emissions from MacDon Industries Ltd. and to undertake stack sampling and computer modelling as necessary to quantify the community impact of the emissions. Their complete final report is attached as Appendix 2 and will be summarized in this section.

Formerly, the largest source of harmful emissions to the atmosphere was the liquid paint line. The release of xylene, the major contaminant, was eliminated by the implementation of the powder coating system. Environment Canada's National Pollution Release Inventory (NPRI) system requires that industries who use in excess of 10 tonnes per year of xylene file an annual report on use and release. Prior to the implementation of the powder coating system MacDon reported a xylene emission of 53.75 tonnes in 1999. In 2001, with a few parts still being liquid painted, the xylene emission was less than 4 tonnes or a reduction of 93% over the 1999 level. At these levels MacDon fell below the NPRI reporting threshold. At that time the plan going forward was to move to complete reliance on the powder coat system and eliminate liquid paint finishing altogether and in 2003 this goal was achieved. As indicated earlier the only liquid painting now done is to touch up damaged assembled goods.

Liquid paint usage is now about 20 litres per week. At this usage level the community exposure level would be many orders of magnitude below the 24 hr. community exposure limit of 2.3 mg/m^3 for xylene.

Tables 1, 2 and 3 taken from the Elias Occupational Hygiene Consultants Inc. report summarize, the community exposure limit, the emission rate, the contaminants emitted and the exposure level for various air borne contaminants.

TABLE 1: Exposure levels for metals from the welding and laser cutting operations.

Material	Community Exposure Limit (mg/m^3)	Emission Rate (g/s)	Exposure level for 1 hr ave. (mg/m^3)	Exposure level adjusted for 24 hr ave (mg/m^3)
C	0.0015	0.000072	0.0000490	0.0000195
Cr(VI)	0.0015	0	0.0000000	0.0000000
C	0.0001	0.000002	0.0000014	0.0000005
M	0.12	0.001056	0.0007191	0.0002861
M	0.0025	0.0025	0.0017025	0.0006774
Ni	0.002	0.000018	0.0000123	0.0000049
Pb	0.002	0.000032	0.0000218	0.0000087
Fe2O3	0.025	0.123	0.0837630	**0.0333266**
T	0.034	0.0002712	0.0001847	0.0000735
Zn	0.12	0.000182	0.0001239	0.0000493
Al Oxide	0.12	0.000549	0.0003739	0.0001488
C	0.05	0.00058	0.0003950	0.0001571

As can be seen from the foregoing table all emission levels, except for ferric oxide, were below the community exposure limits. Iron exposure is not based on a health concern but rather is related to potential soiling of, for example, wash on a clothesline.

The emission rate of 0.123 g/s was comprised of 0.023 g/s from the welders and 0.10 g/s from the lasers (0.023+0.10=0.123 g/s). Since the time that these measurements were made two direct vented laser cutters have been replaced with two new lasers with filtered exhausts. This would conservatively have the effect of halving the emission rate of iron from the lasers. Accordingly the total emission rate would go from 0.123 g/s to 0.023+0.050=0.073 g/s. At this emission rate the 24 hr. exposure level of ferric oxide would be 0.0197 or below the community exposure limit. The plan going forward, as early as this fall, is to replace the two remaining laser cutters with new machines with no atmospheric discharge and to continue to switch the welding operations from direct ventilation to filtration which will virtually eliminate the issue of offsite iron emissions.

TABLE 2: Exposure levels for VOCs from powder coating and hook burning operations.

Material	Community Exposure Limit (risk)	Ave Daily Emission Rate (g/s)	Exposure level for 1 hr ave. (mg/m^3)	Exposure level adjusted for 24 hr ave (mg/m^3)
Benzene	1.00E - 05	0.002	0.00175	0.00088

Based on the daily average exposure, the lifetime risk calculated with the SPREADSHEET TOOL

FOR HUMAN HEALTH PRELIMINARY QUANTITATIVE RISK ASSESSMENT (PQRA) is:

Cancer Risk - Inhalation	1.82E-07
Cancer Risk - Total	1.82E-07
Target Cancer Risk:	1.00E-05

As can be seen from the foregoing information the exposure level was below the acceptable cancer risk for lifetime exposure.

TABLE 3: Exposure levels for other pollutants from hook burning operations.

Material	Community Exposure Limit (mg/m^3)	Emission Rate (g/s)	Exposure level for 1 hr ave. (mg/m^3)	Exposure level adjusted for 24 hr ave (mg/m^3)
Particulates	0.05	0.004	0.0017544	0.0007
SOx	0.275	0.002	0.0008772	0.0003
NOx	0.2	0.02	0.0087720	0.0035
CO	36	0.002	0.0008772	NA

NA = This exposure time does not apply to this material

As can be seen from the foregoing table all emission levels were below the community exposure limits.

2.8.1.2 Employee Exposure

MacDon has conducted numerous occupational health studies in an effort to safeguard employee health and safety. As outlined earlier MacDon works closely with the employee association, Workplace, Safety and Health Department and its own on staff health and safety officials to ensure the work place is safe for all employees. A respiratory protection program is currently underway that is assessing the air quality for welders and evaluating each staff members equipment and how it is used.

It is widely recognized in the industry that one of the challenges is getting employees to use the fume control devices that are provided. In February 2004 a survey was carried out to assess worker exposure to fugitive emissions when the vented welding equipment was used and the system set up with proper positioning of the flexible hood. The resulting exposures were about one-tenth the exposures when no oversight was given. Ongoing training is the best approach to this issue and MacDon works tirelessly to provide it.

MacDon has continued its efforts to re-engineer the fume collection and make up air systems so as to reduce the occupational exposure to welding fume. This process is underway with approximately 59% of the welding fume now being captured by filtration systems.

2.8.2 Green House Gas Emissions (Inventory)

The reporting threshold under the current GHG reporting requirements is 50 kilotonnes of CO_2 equivalent (50 kt CO_2 eq). A facility is required to submit a report if its total direct emissions of GHGs meet or exceed the reporting threshold. To complete this assessment, it is necessary for a facility to calculate its total emissions for the relevant calendar year for the GHGs and emission sources covered.

The MacDon air emissions are related to the combustion of natural gas for space heating, powder coat curing ovens, parts washer water heaters and hook burn off oven. The Canadian Energy Partnership for Environmental Innovation 2012 Natural Gas Emissions Calculator was used for the values in Table 4.

Table 4 Total Annual Green House Gas Emissions

Contaminant	CAS #	Total Annual Releases (Tonnes)	Annual Air Release Threshold (Tonnes)	Percent of Annual Air Release Threshold	Requirement to Report Annual Air Release
Carbon dioxide	630-08-0	3	20	15%	No
Oxides of Nitrogen	11104-93-1	3.5	20	18%	No
PM_{10}	NA-M09	0	0.5	4%	No
$PM_{2.5}$	NA-M10	0.022	0.3	7%	No
Sulphur Dioxide	7446-09-5	0.021	20	0%	No
Total PM	NA-M08	0.022	20	0%	No
VOC's	NA-M16	0.19	10	2%	No

As can be seen from the foregoing table all levels well were below the reporting level.

2.8.3 Type, Quantity and Concentration of Pollutants Released to the Water

Pollutants released to the water would generally be the liquid wastes that are generated on the site. Accordingly, this section will deal with water borne and liquid wastes created on the MacDon site. As indicated earlier all water borne pollutants and storm water from the site is conveyed to the appropriate City of Winnipeg sanitary and/or land drainage systems. Other liquid wastes are either recycled or disposed of via licenced waste haulers under contract to MacDon and in accordance with hazardous waste generator regulations - MacDon registration number MB 1001228. MacDon is currently producing a Pollution Prevention Plan as required under City of Winnipeg Bylaw 92/2010. Table 5 summarizes the liquid wastes generated on the MacDon site by type of pollutant material, source, volume, concentration (if relevant), mitigation measures and the disposal method.

Table 5 - Liquid Waste Handling at MacDon Industries Ltd.

Material	Source	Volume	Potential Contaminants	Mitigation Measures	Disposal/Reuse Methods
Industrial wastewater	Parts washer	35,000 Litres per shift	See analysis in Appendix 3	Pumped discharge, limited floor drains, sludge separation, neutralization	Discharge to city sewer system
Land drainage	Hard surfaced areas	NA	Spilled stored materials	Spill containment barriers and procedures	Discharge to city land drainage system
Waste oil	Vehicle and equipment maintenance	4500-6000 Litres per year	Contaminated engine oil	Limited floor drains, spill containment procedures, secondary containment	Recycled by a licenced waste oil hauler
Waste machining coolant	Machine shop	6000-12000 Litres per year	Metal Cuttings	Limited floor drains, spill containment procedures	Collected by a licenced waste hauler
Waste solvents	Paint shop	500 Litres per year	Xylene MEK	Limited floor drains, spill containment procedures	Collected by a licenced waste hauler

The potential environmental impact of these discharges on receiving waters and mitigation measures will be discussed in subsequent sections. Table 5 does not include the potential for water borne contamination by aboveground stored petroleum and related products, as this will also be addressed in subsequent sections.

2.8.4 Type, Quantity and Concentration of Pollutants Released to the Soil

Pollutants released to the soil would generally be the solid wastes that are generated on the site. Accordingly, this section will deal with the solid wastes created on the MacDon site. As indicated in earlier sections, licensed industrial waste contractor conveys solid waste pollutants from the site to a private or City of Winnipeg sanitary landfill. Other solid wastes are either recycled or disposed of via licenced hazardous waste haulers under contract to MacDon. Table 6 summarizes the type of pollutant material, source, volume, concentration (if relevant), mitigation measures and the disposal method.

Table 6 - Solid Waste Handling at MacDon Industries Ltd.

Material	Source	Volume	Potential Contaminants	Mitigation Measures	Disposal /Reuse Methods
Metal scrap	Cutting and machining operations	15 Bins per week	NA	Collected in bins	Collected by an industrial metal recycler
Refuse	Production, offices, receiving, shipping, cafeteria	165 Tonnes per month	Normal refuse, wood, paper, cardboard	Collected in bins	Collected by a garbage contractor
Liquid paint sludge	Paint booth scrubber	2 Drum per year	Mill oil, metal oxides, soil	Collected and stored in steel drum	Collected by a licenced hazardous waste disposal contractor
Parts washer sludge	Part washer	2000 Litres per year	Mill oil, metal filings, soil	NA	Collected by a waste hauler
Waste powder coat	Powder booths, central vacuum	10-12 Drums per year	Powder paint fines	Collected in drums	Collected by a garbage contractor
Oily rags	Production	1 Bin per month	Waste oil	Stored in metal HazMat container	Collected by a waste hauler
Hook burn off ash sludge	Hook washer	10000 Litres per year	Inert powder coat ash	NA	Collected by a waste hauler

2.8.5 Impact on Wildlife

The MacDon facility is located in a completely fenced site in an industrial park in an urban area and accordingly there are no significant wildlife impacts.

2.8.6 Impact on Fisheries

Sanitary and industrial effluents from the site are discharged under permit to the City of Winnipeg sewer system. The City's Sewer Bylaw 92/2010 regulates these discharges. MacDon has no direct river discharges and accordingly has no impact on fisheries.

Land drainage is managed on the site and then discharged under permit to the City of Winnipeg land drainage system wherein it is conveyed to the Assiniboine River. The City's Sewer Bylaw 92/2010 regulates the discharges to the land drainage system. The potential impact to fisheries would be via accidental spills or leakage of chemicals or hazardous materials onto the hard surfaced site and subsequent release into the land drainage system.

MacDon has in place a spill management and containment protocol that is set out in their Fire Safety Plan manual which has been prepared generally in accordance with the guidelines of the Industrial Emergency Response Planning Guide published by the Manitoba Industrial Accidents Council.

The fuel storage systems are managed according to the principles set out in the Environmental Code of Practice for Aboveground Storage Tank Systems Containing Petroleum Products and Manitoba Regulation 188/2001. The site is foot patrolled every hour by the security staff and is monitored 24/7 by closed circuit television.

2.8.7 Impact on Surface Water and Ground Water

As outlined in the foregoing section MacDon does not have any direct discharges to surface bodies of water and accordingly has no impact on surface water.

The potential impact to groundwater is via accidental spills or leakage of chemicals or hazardous materials on the site. Since the entire site is hard surfaced and connected to the land drainage system the potential for groundwater contamination via a spill is considered to be insignificant. The management of surface spills has been discussed earlier.

2.8.8 Impact on Forestry

The MacDon facility is located in a completely fenced site in an industrial park in an urban area and accordingly there are no significant forestry impacts.

2.8.9 Impact on Heritage Resources

The MacDon facility is located in a completely fenced site in an industrial park in an urban area and accordingly there are no significant heritage resource impacts. As part of the Assessment of Environmental Risk report prepared in 1993 for the Royal Bank a land title custody chain was completed. This trace of the titles back to their origin revealed that there is no history of significant heritage resources on these properties.

2.8.10 Socio-economic Implications Resulting from Environmental Impacts

MacDon strives to ensure that its operations contribute a positive impact on the socio-economic fabric of Manitoba including its environmental impact. The company provides direct employment to 1500 staff and indirect employment to hundreds of others in the supply and service industries.

MacDon is sensitive to environmental concerns as evidenced by the implementation of the new environmentally friendly manufacturing processes. The company's environmental practices are founded on the principles of reduce, recycle and reuse.

2.9 Environmental Management Practices

MacDon strives to improve their products and manufacturing processes utilizing a "continuous improvement methodology." Environmental management, health and industrial hygiene issues are handled under the "umbrella" of the health and safety program, which functions in accordance with provincial regulatory requirements and the Manitoba Workplace Safety and Health Act, and their accompanying CSA standards and regulations. MacDon has 5 functioning Health and Safety Committees, and a Joint Occupational Safety and Health Committee (which meets quarterly). MacDon has a Safety Program Manual, an Incident Reporting System and, a database of all WHMIS controlled products, which encompasses all aspects of provincial regulatory requirements. All issues regarding fire safety, emergency response, emergency evacuation, environmental events, personnel safety, product safety, infrastructure protection and security fall under the umbrella of the Safety Program. The Vice President, Operations has corporate responsibility for environmental health and safety issues.

3.0 SCHEDULE

The MacDon operation in Murray Industrial Park has been on going since 1976. There are no immediate plans to vacate the facility. Should the operation be terminated the close attention that MacDon has paid to environmental issues would make environmental restoration and rehabilitation of the site upon decommissioning relatively simple and straightforward.

4.0 FUNDING

No government grants or capital loans have been requested or obtained for the construction of MacDon facilities. The company has taken advantage of the grants available under the Manitoba Hydro Power Smart program in conjunction with MacDons' energy conservation initiatives.

APPENDIX 1 – LAND TITLE INFORMATION

BARNES & DUNCAN
LAND SURVEYORS

298 FORT STREET
WINNIPEG, MANITOBA
R3C 1E5

CLIENT:
MacDON INDUSTRIES LTD.

MURRAY INDUSTRIAL PARK
WINNIPEG, MANITOBA

SKETCH SHOWING CERTAIN BUILDINGS LOCATED WITHIN MURRAY INDUSTRIAL PARK

OF PART OF

RIVER LOT 12
PARISH OF ST. JAMES

BEING

LOTS 11, 12 AND 13, BLOCK 2, PLAN 11955,
LOT 5, PLAN 13115,
LOTS 1, 2, AND 3, PLAN 14677,
LOT 4, PLAN 22348,
PARCELS E, F, G, AND H, PLAN 36975 AND
PARCELS A, B AND C, PLAN 40061

CITY OF WINNIPEG
MANITOBA

SCALE - 1 Inch = 100 Feet

TITLE INFORMATION:

CERTIFICATE OF TITLE: 2552299 W.L.T.O. (SEARCH DATE: NOVEMBER 8, 2011) SHOWN IN [hatched box]
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: LOT 1, PLAN 14677 WLTO
IN RL 12 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENT 235481, IS REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

CERTIFICATE OF TITLE: 2093378 W.L.T.O. (SEARCH DATE: NOVEMBER 8, 2011) SHOWN IN [box]
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: FIRSTLY: PARCELS E, F, G AND H, PLAN 36975 WLTO
IN RL 12 PARISH OF ST. JAMES
SECONDLY: LOTS 2 AND 3, PLAN 14677 WLTO
IN RL 12 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENTS 235481, 2426449, 3021491 AND 3021492, ARE REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

CERTIFICATE OF TITLE: 1543494 W.L.T.O. (SEARCH DATE: NOVEMBER 8, 2011) SHOWN IN [hatched box]
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: LOTS 11, 12 AND 13, BLOCK 2, PLAN 11955 WLTO
EXC. ALL MINES AND MINERALS
IN RL 12 AND 13 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENTS 235482, 236104 AND 2227459 ARE REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

CERTIFICATE OF TITLE: 1150996 W.L.T.O. (SEARCH DATE: NOVEMBER 8, 2011) SHOWN IN [box]
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: LOT 5, PLAN 13115 WLTO
EXC. ALL MINES AND MINERALS
IN RL 12 AND 13 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENTS 82-12315, 85-23806 AND 85-23807 ARE REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

CERTIFICATE OF TITLE: 1843264 W.L.T.O. (SEARCH DATE: NOVEMBER 8, 2011) SHOWN IN [box]
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: PARCELS A, B, AND C, PLAN 40061 WLTO
EXC. OUT OF PARCELS B AND C, ALL MINES AND MINERALS
IN RL 12 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENTS 222446, 232110, 235482, 2426449, 2670501, 3531313, 85-70584 AND 85-56918 ARE REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

CERTIFICATE OF TITLE: 1764865/1 W.L.T.O. (SEARCH DATE: JANUARY 20, 2012) SHOWN IN [box]
REGISTERED OWNER: MACDON INDUSTRIES LTD.
LEGAL DESCRIPTION: SP LOT 4, PLAN 22348 WLTO
EXC. OUT OF PARCELS B AND C, ALL MINES AND MINERALS
IN RL 12 PARISH OF ST. JAMES
ENCUMBRANCES: INSTRUMENTS 232110/1 AND 235482/1 ARE REGISTERED AGAINST THE ABOVE CERTIFICATE OF TITLE.
ENCUMBRANCES NOTED HEREIN ARE PROVIDED FOR INFORMATION ONLY
AND HAVE NOT BEEN INVESTIGATED AS TO THEIR INTENT OR EXTENT.

APPENDIX 2- ELIAS OCCUPATIONAL HYGIENE CONSULTANTS INC. REPORT

MacDon Industries Ltd.
Winnipeg Manitoba

Environmental Assessment
Air Emissions

July 3, 2012

Elias

Occupational Hygiene Consulting Inc.

108 [illegible] Drive Winnipeg Manitoba [illegible]

Tel: 204-261-1770 Fax: 204-275-1171

Cell: 204-[illegible] E-mail: [illegible]

Environmental Assessment

Environmental Assessment
Dispersion Modeling

MacDon Industries Ltd.
Winnipeg Manitoba

OHG Project Number 10-J-774

Survey Performed by:

John Elias, MPH, CIH, ROH, CRSP
Denis Nikkel, BSc, CIH, ROH, CRSP
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Cell: 204-996-0234 E-mail: jelias@mts.net

July 3, 2012 **Project No.** 10-J-774

William D. Carroll
MacDon Industries Ltd.
680 Moray
Winnipeg MB R3J 3S3

Dear Mr. Carroll:

SUBJECT: Air Emissions from MacDon Industries Ltd

Elias Occupational Hygiene Consulting Inc. is pleased to submit Environmental Assessment Report on the impact of airborne emissions from your Murray Industrial Park facility on neighbouring residential areas.. Should you have any questions or require additional assistance please contact Mr. John Elias.

Yours truly,
Elias Occupational Hygiene Consulting Inc

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Dispersion Modeling For MacDon Industries Limited Environmental License Application

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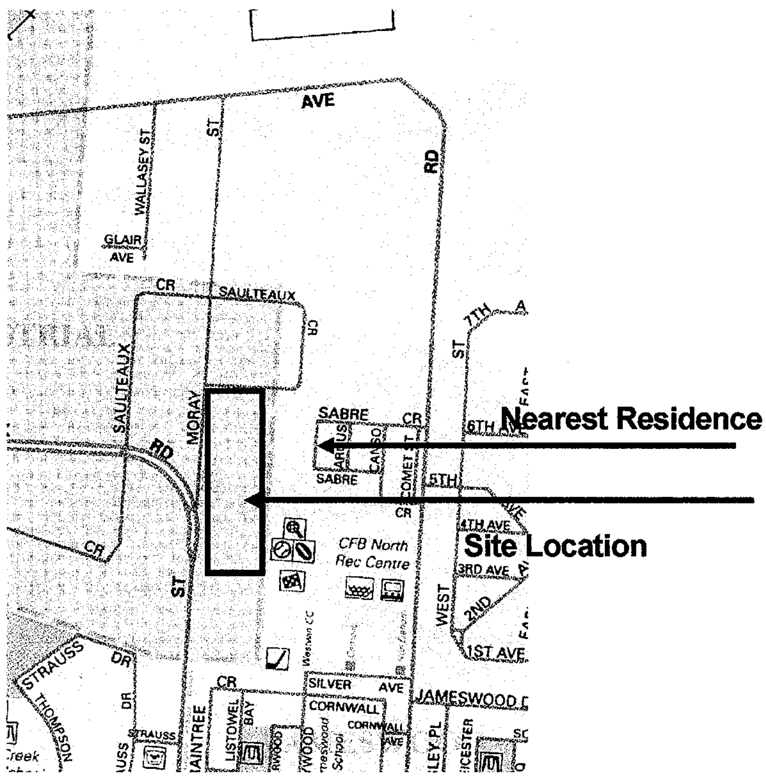
Environmental License Application

1.0 BACKGROUND

This assessment was prepared as part of an Environmental License application.

Figure 1 shows the location of the facility. The nearest residential area is about 150 m from the facility.

FIGURE 1: Site location



1.1 PROCESS DESCRIPTION

MacDon Industries manufactures harvesting and other equipment. The Murray Industrial Park facility includes warehousing, engineering, parts, manufacturing, and administration in over 520,000 square feet.

The emissions of concern and potential sources are shown in Table 1.

TABLE 1: Potential sources of airborne materials to be assessed.

Airborne Materials	Source
Metals	Laser cutting
	Welding
	Building exhaust
VOCs	Hook burn-off
Other (Particulates, SO_2, NO_x, CO)	Hook burn-off

2.0 EXPOSURE LIMITS FOR CHEMICALS OF INTEREST

The following is a review of the chemicals of interest emitted from the facility.

Diesel emissions were originally considered as a potential emission source. Subsequent review showed that this would not be a significant source of emissions in the industrial park. The diesel engines in the self propelled windrower are started and run for a ten minute period at the Run-up Station and the Hydraulic Test Station. Since the operating time is short, and the engines are small, the emissions would be low, and therefore are not considered here.

Similarly, the washer is not considered as a source of emissions. The phosphoric acid would not evaporate and contains no VOCs and thus does not become airborne in any significant amount. The washing process also includes biodegradable neutral soaps that are not considered hazardous.

2.1 METALS

A large part of the welding and cutting emissions are released from the building roof vents. The welding and cutting emissions are discussed below as separate sources, but since emissions are released through roof vents or short stacks with caps that direct the emissions down onto the roof, they will be treated as a single volume source in the modeling portion of the assessment.

2.1.1 WELDING

The main pollutants of concern during welding operations are metals identified in E PA documentation and sampling results collected inside building. Depending on the choice of electrode and its diameter and composition, emissions are reduced or increased. To a lesser degree the workpiece composition also affects the quantity of fume released.

The welding fume is formed by the vaporization and condensation of metallic elements upon cooling in ambient air. As such, the particulate matter produced is generally submicron in size with approximately 50% to 75% of the particles having diameters in the range of 0.4 to 0.8 µm. The amount of the emissions generated can vary substantially from process to process.

The elemental composition of the fume varies with the electrode and workpiece composition. Hazardous metals, which have been detected in welding fume, include manganese, nickel, chromium, cobalt, and lead. Manganese is present at detectable levels in most welding processes. The other metals are found at lower quantities.

The welding rod used is the Lincoln Electric L-56. This is a AWS classification ER70S-6. The ingredients listed on the MSDS are:

Total manganese	1-10%
Total Copper	<0.5%
Iron	Balance

EPA's document "AP-42, Compilation of Air Pollutant Emission Factors" has the following emission factors for E70S welding operations for materials of concern:

Emission	Emission Factor (10^{-1} g/kg)
Total Fume	5.2
Cr	0.01
Cr(VI)	ND
Co	<0.01
Mn	3.18
Ni	0.01
Pb	ND

EPA has claimed that these tests were performed by a sound methodology and are reported in enough detail for adequate validation.

Table 2 contains the metals used in the rods, hazardous materials from welding that EPA was concerned about and related airborne metals found in the workplace air. The exposure limits were taken from the Ontario Ministry of the Environment Standards Development Branch. The third column has the exposure time that the exposure limit was based on, and the fourth column shows the effect that the exposure limit was based on. It should be noted that most metals exposure limits are for elemental metals, however, aluminum and iron are based on the oxide.

TABLE 2: Metals of concern, their exposure limit, exposure time and the effect that the exposure limit is based on.

Metals of Concern	Exp Limit (mg/m3)	Time	Effect
Cr	0.0015	24	Health
Cr(VI)	0.0015	24	Health
Co	0.0001	24	Health
Mn	0.0025	24	Health

Metals of Concern	Exp Limit (mg/m3)	Time	Effect
Ni	0.002	24	Vegetation
Pb	0.0005	24	Health
Fe_2O_3	0.025	24	Soiling
Ti	0.034	24	Health
Zn	0.12	24	Health
Al Oxide	0.12	24	Particulate
Cu	0.05	24	Health

2.1.2 LASER CUTTING

The hot rolled steel used is cut with lasers. The emissions consist of a metal fume from the steel similar to that from welding. The cutting process itself adds nothing to the emissions. Emission factors were not available for laser cutting, and therefore a sample of the exhaust plume was collected and analyzed to determine what was in the plume and how much was in the plume.

Four laser cutters are used. A sample was collected from one of the large cutters and a small cutter when heavy plate was being cut, and emissions were expected to be a worst case scenario. Table 3 shows the metals of concern.

The emissions of concern from laser cutting are similar to the welding emissions that EPA reported. The exposure limits were taken from the Ontario Ministry of the Environment Standards Development Branch for the metals or oxides of concern. The third column has the exposure time that the exposure limit was based on, and the fourth column shows the effect that the exposure limit was based on.

TABLE 3: Metals of concern in the laser emissions, their exposure limit, exposure time and the effect that the exposure limit is based on.

Metals of Concern	Exp Limit (mg/m3)	Time	Effect
Cr	0.0015	24	Health
Cr(VI)	0.0015	24	Health
Co	0.0001	24	Health
Mg	0.12	24	Particulate
Mn	0.0025	24	Health
Ni	0.002	24	Health
Pb	0.0005	24	Health
Fe_2O_3	0.025	24	Soiling
Ti	0.034	24	Health
Zn	0.12	24	Health
Al oxide	0.12	24	Particulate
Cu	0.05	24	Health

2.2 VOCs

The VOCs are released from short stacks with caps that direct the emissions down onto the roof, therefore the VOC emissions are treated as a single volume source in the modeling portion of this assessment. It should be noted that the high temperature of the hook burn-off stack provides some buoyancy, and the plume does rise when air movement is low. Emissions from the curing oven are released with enough velocity that the plume rises free of the building when air movement is low. As a result the exposures from the hook burn-off and the curing oven are overestimated.

2.2.1 POWDER COATING

MacDon has converted its liquid coating operations to powder coating. There are two phases to this operation, application of the powder coating, and curing of the powder coating.

2.2.1.1 POWDER COATING APPLICATION

Powder coatings have minimal organic HAP and VOC emissions (cure volatiles), generally result in a smaller waste stream, and have higher durability as compared to traditional liquid coatings. Because powder coatings are applied as dry particles, no solvent-based volatiles are released during the application operation, and cure volatile emissions from the curing operation, if any, are generally much less than the volatile emissions from liquid coating systems. Typically, powder overspray is recycled and reused rather than discarded as waste. Transfer efficiency for powder without a recovery system is estimated to be approximately 60 percent, but can be greater than 99 percent with recovery. The system used at MacDon uses a recovery system.

The coating used here is a polyester based material. The hazardous ingredients as reported in the MSDS are listed below in Table 4.

TABLE 4: Additives to the polyester coating powder.

Name	**CAS #**	**% by Weight**	**Exposure Limit**
Carbon Black	1333-86-4	1 - 5	TWA: 3.5 mg/m3 ACGIH
1,3,5-Triglycidyl Isocyanurate (TGIC)	2451-62-9	1 - 5	TWA: 0.05 mg/m3 ACGIH
Crystalline silica	14808-60-7	0.5 - 1.5	TWA: 0.05 mg/m3 ACGIH

Environmental emissions from powder coating application do not appear to be a significant problem. However it can be a concern for the workers who apply it, and therefore workplace exposure limits are shown above. At MacDon those employees wear protective suits and breathe filtered air through supplied air respirators.

2.2.1.2 POWDER COATING CURING

Two types of powder coating resin materials exist: thermosetting and thermoplastic. Thermosetting powders harden during heating inside a bake oven as a result of cross-linking or polymerizing of the resin. Common thermosetting resin types include epoxies, polyesters, hybrids, polyurethanes, and acrylics. Thermoplastic powders soften with the application of heat and resolidify during cooling, but continue to have the same chemical composition. Typical thermoplastic resins include polyethylene, polypropylene, nylon, polyvinyl chloride, thermoplastic polyamides, and thermoplastic polyesters. The coatings used by MacDon are thermosetting polyester resins.

Since powder coatings contain no solvents, organic HAP and VOC emissions are eliminated during coating preparation and application as compared to conventional liquid coating systems. Some organic HAP and VOC emissions may be released after powder coating application during the curing process (cure volatiles).

Depending on the specific resin type and additives used in the powder formulation, cure volatiles may be produced by two mechanisms. First, organic components in the formulation may be volatilized when the powder is subjected to heat without undergoing a chemical reaction. The second mechanism is a chemical reaction between the additives in the powder when exposed to the heat of curing that creates organic compounds, and then these organic compounds are volatilized. The amount of cure volatiles released is dependent on many factors including resin type, cure time, and cure temperature. Emissions may occur from the curing of powder coatings at temperatures greater than 160°C (320°F). Two-to-six mass percent of urethane polyester powder coatings may be emitted as volatile compounds in the curing step. Urethane polyester powders represent the powder type with the greatest potential for volatile emissions due to the use of isocyanate curing agents which are blocked with caprolactam. The unblocking reaction occurs when heat is applied in the curing oven, and caprolactum (which is not a HAP) is released.

The thermosetting polyester used at Macdon does not use isocyanates or caprolactam, but an isocyanurate, thus eliminating caprolactam as an emission.

2.2.2 HOOK BURN-OFF

Parts are suspended on metal hooks as they pass through the powder coater. In addition to supporting the piece being coated, the hooks provide an electrical contact needed for complete coverage. A buildup of the coating insulates the hook so that it can no longer act as an electrical conductor. The coating is removed by placing the hooks in an incinerator and burning off the coating.

A Bayco Heat Cleaning Oven is used to clean the hooks. The oven includes a primary processing chamber, an integral afterburner, temperature controls for burners and air supply, and a water mist injection system.

The primary chamber is cart loaded, with a refractory firebox underheating the load. This provides fast heat transfer to bring the load rapidly to devolatization temperature (250-400°F). The afterburner is kept off below this temperature to conserve fuel. At the control's adjustable low set point, it automatically switches on.

As temperature in the primary rises to 600-700°F, devolatization of the load increases. Afterburner temperatures rise to 1400°F to oxidize these fumes.

Most volatiles ignite in the 650-750°F range, causing rapid temperature rise to the control's adjustable high set point. This automatically shuts down the primary chamber burner and air supply. As oxygen is consumed, the flame is extinguished and roasting conditions established.

Hydrocarbons decompose into volatiles and carbon particles (smoke) in this low oxygen environment. The decomposition rate is primarily a function of temperature, providing oxygen remains excluded.

As air flow in the primary chamber is very low, velocities across the parts are low, and little ash is entrained and carried to the stack.

Gaseous products pass into the afterburner at 650-750°F. This is a low oxygen mixture of volatile vapors and smoke.

Oxidizing this mixture requires introducing secondary air, raising the temperature with a secondary burner, mixing the ingredients, and holding them at temperature long enough to complete oxidation.

Secondary air is induced by stack natural draft through a port designed to provide 100% excess air. The secondary burner is sized to raise primary products and secondary air to 1400°F.

The supplier provided a list of emissions (particulates, SO_x, NO_x, CO and hydrocarbons) measured in the stack of a similar oven, The supplier was unable to provide a breakdown of the hydrocarbons emitted from the oven, only the total amount emitted. To determine what materials are emitted, two samples were collected from the stack once the oven was up to operating temperature. The samples were analyzed to determine what components made up the hydrocarbon group, and what proportion of the total each was. This would allow the emission rates to be estimated. Benzene was found in the smaller sample at about the level of detection. It was not found in the larger sample, and could have been an analytical anomaly.

Table 5 contains the exposure limits for the materials identified in the emissions from the hook burning operation.

The exposure limits were taken from the Ontario Ministry of the Environment Standards Development Branch except for benzene which was taken from Health Canada. The third column has the exposure time that the exposure limit was based on, and the fourth column shows the effect that the exposure limit was based on.

TABLE 5: Volatile chemicals emitted from the hook burn-off oven, their exposure limit, exposure time and the effect that the exposure limit is based on.

Volatile Chemicals	Exposure Limit (mg/m3)	Exposure Time (hrs)	Health Effect
PARTICULATES:	0.05	24	Health
SOx:	0.275	24	Health
NOx:	0.2	24	Health
CO:	36	1	Health
BENZENE	1.00E - 5	Lifetime	Health (lifetime risk for cancer)

3.0 DISPERSION MODEL

Potential exposures were estimated with a "dispersion model". Dispersion models are mathematical models of the atmosphere's capacity to diffuse and transport emissions from a source.

The model used here is the Screen3 model developed by the Environmental Protection Agency, with a Windows interface developed by Lakes Environmental. The program is based on the document "Screening Procedures for Estimating The Air Quality Impact of Stationary Sources" (EPA 1995). Screen3 was developed to provide a screening method of estimating airborne exposure concentrations downwind from a point source.

Screen3 can perform single source short-term calculations including estimating maximum ground-level concentrations and the distance to the maximum, incorporating the effects of building downwash on the maximum concentrations for both the near wake and far wake regions, and estimating concentrations in the cavity recirculation zone.

Screen3 can not explicitly determine maximum impacts from multiple sources. This must be done by merging the emissions into a single representative stack..

The Screen3 model estimates average exposures over a one hour period. If the exposure limit is for a different averaging time, the output from the model can be adjusted by using the formula prescribed by Manitoba Conservation, as described below:

$$\chi_S = \chi_k ({t_k}/{t_s})^{\rho}$$

where χ_s = desired concentration estimate for the sampling time t_s.
χ_k = original concentration for sampling time t
ρ = a factor to take into account the stability of the atmosphere

Stability Class	ρ
A	0.65
B	0.52
C	0.43
D	0.35
E	0.29
F	0.23

As a screening model, Screen3 estimates worst case conditions by examining a full range of meteorological conditions including all stability classes and wind speeds to find maximum impacts.

3.1 STANDARDIZED MODEL OUTPUT

Because there were several emissions being released under identical conditions the models were run with a standardized emission rate of 1 grams/second (g/s). That is, the Screen3 model was run with an assumed emission rate of 1 g/s. Since the model output exposure levels are proportional to the input emission rate, the actual predicted exposure levels can be determined by multiplying the actual emission rate for each ingredient of interest by the model output exposure level.

4.0 MODEL INPUT INFORMATION

4.1 SOURCE INFORMATION

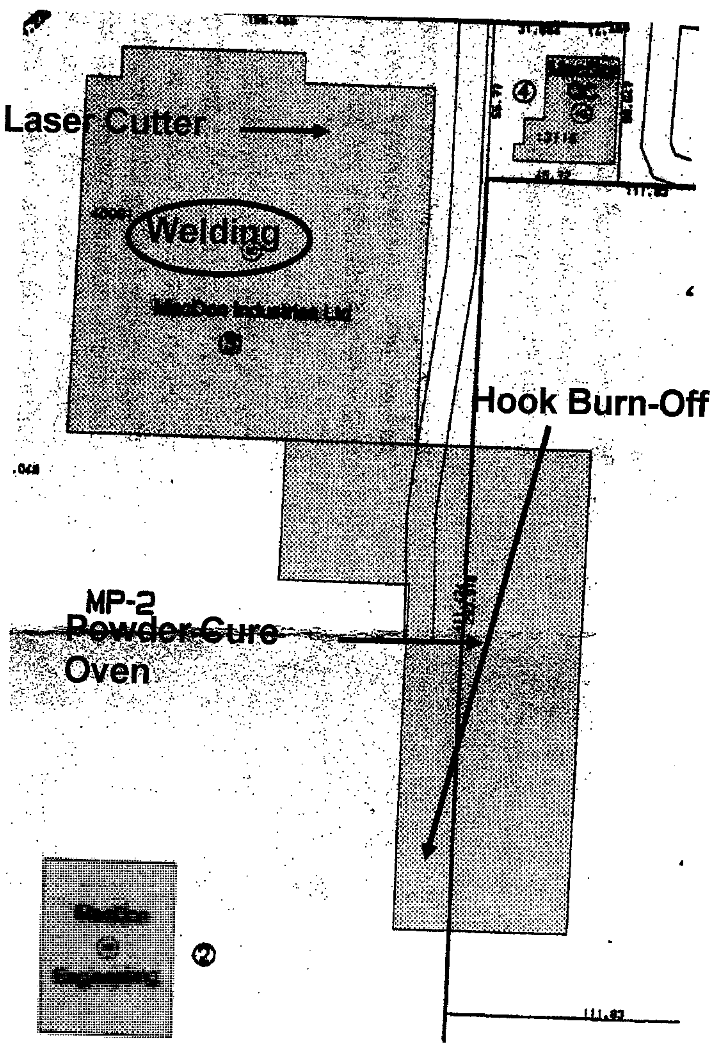
The emissions originate from two joined buildings. For the model, they were treated as two separate buildings with the following dimensions:

Main Manufacturing Bldg	**ft**	**m**
Length	401	122
Width	410	125
Height	25	8
New Paint Bldg		
Length	560	171

Width	200	61
Height	30	9

The stacks shown in Figure 2 are short with releases close to the roof. In most cases they have a cap that redirects the plume back down onto the roof. Therefore all calculations treat the emissions as a volume source.

Figure 2: Location of main emission points



4.2 EMISSION RATES

4.2.1 WELDING

From the amount of rod used, the EPA emission factor for E70 rod, and production time, the production rate for total welding fume can be calculated as shown in Table 6 below.

TABLE 6: Steps taken to calculate the total amount of welding fume generated.

	Calculation Step	Amount	Units
1	EPA emission Factor for E70 welding rod	5.2	g/kg rod
2	Annual wire usage	143352	kg/year
3	Work time (24hrs/day, 48 wk/year, 5 day/wk)	20736000	sec/year
4	Welding rod consumption (Step 2/Step 3)	0.0069132	kg/sec
5	Total amount of welding fume generated (Step 1 x Step 4)	0.0359486	g/sec

All welding is carried out under fume extractors. About 55% of all welding is carried out under fume extractors connected to filtration systems. The remainder of the welding is carried out under extractors vented to the outside. To determine the amount of welding emissions that are discharged to the environment from the welding carried out under the filtered fume extractors, the filters were cleaned at the start of a work week. After a week, the captured particulates and the amount of rod used were weighed, and the capture efficiency calculated. (See Table 7)

TABLE 7: Calculation of capture efficiency for welding fume from welders using filtered extraction hoods.

		Amount	Units
1	Total Wire Used	280	Kg
2	Wt of dust in barrels	0.24	Kg
3	Wt of dust in filters	0.20	Kg
4	Total dust collected (Steps 2+Step 3)	0.44	Kg
5	Total dust predicted (from EPA emission factor) (Step 1*.0052)	1.46	Kg
6	Amount of dust released (Step 5-Step 4)	1.02	Kg
7	Capture efficiency (100*(Step5-Step4)/Step 5	30.23	%

The amount of dust released is made up of the particulate that passed through the filters, and that portion that was not caught by the extraction units. Table 8 shows the calculation of the total emissions from welding released to the environment. This is made up of the material that was not captured by the extractors, plus the particulate generated by the unfiltered welding. The calculations were based on the total welding fume generated from Step 5 in Table 6, and the capture efficiency from Table 7.

TABLE 8: Steps taken to determine the amount of welding fume released/second

	Calculation Step	Amount	Units
6	Portion of fume filtered (55% of total) (Step 5 x 0.55)	0.0197717	g/sec
7	Portion of filtered fume captured (30%) (Step 6 x 0.30)	0.0059776	g/sec
8	Amount of filtered fume released (Step 6 – Step 7)	0.0137941	g/sec
9	Portion of fume unfiltered (45% of total) (Step 5*0.45)	0.0161769	g/sec
10	Total amount of welding fume released (Step 8 + Step 9)	0.029971	g/sec

The fume is released through low vents with caps, as part of the building exhaust air, or through other openings in the building.

To determine the amount of each metal of concern in the welding fume, air samples were collected in the welding area, and analysed for the individual metal content. Table 9 shows the data collected.

1. Column 1 lists the metals of concern from EPA and other welding fume components found in the air samples.
2. Column 2 is the average amount of metals found in each sample.
3. Column 3 is the molecular formula for the expected oxide of metals found in the samples. The materials in the welding fume would be in the form of an oxide, not the metal.
4. Column 4 is the average weight of the oxide found in the sample. At the bottom of the column is the total weight of the oxides. This is the total weight of the welding fume generated.
5. Column 5 is the calculated percent of material of concern in the welding fume. For aluminum and iron it is the oxide that we are concerned about.

TABLE 9: Metal samples collected in the welding area. The material of concern is in **BOLD**

	Avg. wt metal (ug) in air samples	**Oxide Formula**	**Ave. wt oxide (ug) In air samples**	**% of material of concern in total welding fume**
Cr	0.253	Cr2O3	0.37	0.25
Cr(VI)	0	-	-	-
Co	0	-	-	-
Mg	3.333	MgO	5.527	3.25
Mn	7.757	Mn2O3	11.15	7.55
Ni	0	-	-	-

	Avg. wt metal (ug) in air samples	Oxide Formula	Ave. wt oxide (ug) In air samples	% of material of concern in total welding fume
Pb	0.115	PbO	0.124	0.11
Fe	56.666	**Fe2O3**	81.02	78.9
Ti	0.933	TiO2	0.559	0.91
Zn	0.5	ZnO	0.623	0.49
Al	0.9	**Al2O3**	1.7	1.66
Cu	1.287	CuO	1.611	1.25
Total amount of welding fume			102.684	

The emission rate for each metal is shown in Table 10.

1. Column 1 lists the metals of concern from EPA and other welding fume components found in the air samples.
2. Column 2 is the calculated percent of material of concern in the welding fume as shown in Table 9, Column 5. Column 2 does not does not include, silicates, carbonates, oxides (except for Al and Fe), cellulose or binders. By treating the welding fume as consisting only of the materials of concern, the amount of materials of concern are overestimated.
3. Column 3 is the calculated emission rate for each meal, calculated by multiplying the value in Column 2 by the total welding fume emission rate of 0.03 g/s.

TABLE 10: Emission rates for the metals when welding when applied at an average application rate of 0.0069 kg of rod/s with 0.03 g/s of welding fume released.

Metals of Concern	% of material of total welding fume	Emission Rate (g/s)
Cr	0.25	0.00007
Cr(VI)	-	0
Co	-	0
Mg	3.25	0.001
Mn	7.55	0.002
Ni	-	0
Pb	0.11	0.00003
Fe_2O_3	78.9	0.023
Ti	0.91	0.0003
Zn	0.49	0.0001
Al oxide	1.66	0.0005
Cu	1.25	0.0004

4.2.2 LASER CUTTING

Emissions were the laser cutters were estimated by taking air sampled from two cutters and then doubling it for a worst case condition. This was done because work on two cutters could be maintained at peak levels more likely that it could on all four cutters, giving a worst case condition. The emission rate was then calculated by multiplying the total amount of material emitted by the total ventilation capacity of the laser cutter fans (4 m^3/s):

$$\text{Emission rate (g/s)} = g/m^3 \times 4\ m^3/s$$

These calculations are shown in Table 11 below.

TABLE 11: Emission rates for the metals of concem in the cutting plume used when all three cutters were in use.

Metals of Concern	Ave. emissions for two laser cutters $\mu g/m^3$	Total emissions with all 4 systems $\mu g/m^3$	Emmision rate g/s
Cr	0.25	0.5	0.0000020
Cr(VI)	0	0	0.0000000
Co	0.25	0.5	0.0000020
Mg	7	14	0.0000560
Mn	63.25	126.5	0.0005063
Ni	2.3	4.6	0.0000184
Pb	0.25	0.5	0.0000020
Fe_2O_3	12541	25082	0.100379
Ti	0.15	0.3	0.0000012
Zn	4	8	0.0000320
Al Oxide	6.11	12.22	0.000049
Cu	26.35	52.7	0.0002109

4.2.3 TOTAL METAL EMISSION RATE

TABLE 12: Total emission rate for metals from welding and laser cutting.

Metals of Concern	Emission Rate Welding (g/s)	Emission Rate for Laser Cutters (g/s)	Total Emission Rate (g/s)
Cr	0.00007	0.000002	0.000072
Cr(VI)	0	0	0
Co	0	0.000002	0.000002

Metals of Concern	Emission Rate Welding (g/s)	Emission Rate for Laser Cutters (g/s)	Total Emission Rate (g/s)
Mg	0.001	0.000056	0.001056
Mn	0.002	0.0005	0.0025
Ni	0	0.000018	0.000018
Pb	0.00003	0.000002	0.000032
Fe_2O_3	0.023	0.10	0.123
Ti	0.00027	0.0000012	0.0002712
Zn	0.00015	0.000032	0.000182
Al Oxide	0.0005	0.000049	0.000549
Cu	0.00037	0.00021	0.00058

4.2.3 HOOK BURN-OFF

The emission rates were estimated by the manufacturer by scaling actual stack test results from an oven with a lower input and processing rate. The maximum processing rate of the proposed oven will be 1.51 times the test oven processing rate, therefore the emissions have been multiplied by 1.51 to obtain the maximum expected emissions for this oven. The stack test results are shown in Table 13

Table 13: Emission rates provided by the oven supplier.

EMISSIONS	TEST OVEN	EMISSION RATES FOR PROPOSED OVEN
PARTICULATES:	0.02 lbs/hr x 1.51 =	0.03 lbs/hr
SOx:	<0.01 lbs/hr x 1.51 =	<0.015 lbs/hr
NOx:	0.1 lbs/hr x 1.51 =	0.151 lbs/hr
CO:	<0.01 lbs/hr x 1.51 =	<0.015 lbs/hr
HC:	<0.02 lbs/hr x 1.51 =	<0.03 lbs/hr

Table 14 shows the individual hydrocarbons found, and the portion of the total that each material was. Only benzene was found, and it was assumed that the emission rate for benzene was equal to the total amount of hydrocarbon reported by the manufacturer.

TABLE 14: Hydrocarbons found in the emissions from the oven.

EMISSIONS	PORTION OF TOTAL HYDROCARBONS	EMISSION RATES
Benzene	1	<0.03 lb/hr

Hooks are bumed each day to remove the coating from them. The bum takes 3-4 hours, with two burns /day, whereas the exposure limits are for 24 hours or longer. Therefore the emission rate over a day would be overestimated in this assessment. .

TABLE 15: Emission rates for the oven when burning hooks.

EMISSIONS	EMISSION RATE (lbs/hr)	Peak Emission Rate (g/s)
PARTICULATES:	0.03 lbs/hr	0.004
SOx:	<0.015 lbs/hr	0.002
NOx:	0.151 lbs/hr	0.02
CO:	<0.015 lbs/hr	0.002
Benzene	<0.03 lbs/hr	0.004

5.0 COMMUNITY EXPOSURES

A copy of the printed dispersion model outputs are shown in Appendix A.

The peak exposure levels for a volume source with an emission rate of 1 g/s predicted by the model are shown in Table 16 and are the highest exposure levels. These values will occur 68 m from the main plant and 87 m from the new paint facility, when there is a stability class E and a wind speed of 1 m/s. Column 5 shows the peak exposure levels at the nearest residence 150 m from the source.

Table 16: Predicted one hour peak exposure level for an emission rate of 1 g/s.

Building	Distance to Peak Level (m)	Wind Speed (m/s) and Stability Class	Peak one Hour Exposure Level for a 1g/s emission rate (mg/m^3)	Peak one Hour Exposure Level for a 1g/s emission rate @ the nearest residence (mg/m^3)
Main Building	68	1 m/s, Class E	0.68 (@ 64 m)	0.45 (@150 m)
Paint Building	87	1 m/s, Class E	0.44 (287 m)	0.34 (@150 m)

Since the model predicts a one hour peak level, the exposure level must be adjusted to the exposure time for the exposure limit used for metals, particulates and gases (24 hr). The conversion factor for stability class E is 0.48 to convert to a 1 hr time period to a 24 hour time period.

The benzene level is different. It is taken from the Health Canada exposure criteria, and as a carcinogen it is a lifetime exposure limit.

5.1 EXPOSURE LEVELS FOR METALS

Peak exposure levels for metal emissions from the welding and laser cutting operations are shown in Table 17. The emission rates in g/s for welding and cutting are shown in Table 12 Column 4. The one hour exposure level (Column 4) for the metals were calculated by multiplying the combined Emission Rate by the Peak One Hour Exposure level from Table 16, Column 4. The 24 hour exposure levels are shown in Column 5. These are the peak exposure levels 68 m from the main building. Peak exposure levels at the nearest residential area can be determined by multiplying the peak levels by 0.66.

All exposure levels were below the exposure limits except for iron. The peak exposure level for iron was above the exposure limit for iron oxide (0.025 mg/m^3), and may result in soiling. The peak exposure level for iron at the nearest residential area would be 0.021 mg/m^3 (peak 24 hr level 0.033 x 0.66).

TABLE 17: Exposure levels for metals from the welding and laser cutting operations located in the main building.

Material	Community Exposure Limit (mg/m^3)	Emission Rate (g/s)	Exposure level for 1 hr ave. (mg/m^3)	Exposure level adjusted for 24 hr ave (mg/m^3)
Cr	0.0015	0.000072	0.0000490	0.0000195
Cr(VI)	0.0015	0	0.0000000	0.0000000
Co	0.0001	0.000002	0.0000014	0.0000005
Mg	0.12	0.001056	0.0007191	0.0002861
Mn	0.0025	0.0025	0.0017025	0.0006774
Ni	0.002	0.000018	0.0000123	0.0000049
Pb	0.002	0.000032	0.0000218	0.0000087
Fe_2O_3	0.025	0.123	0.0837630	**0.0333266**
Ti	0.034	0.0002712	0.0001847	0.0000735
Zn	0.12	0.000182	0.0001239	0.0000493
Al Oxide	0.12	0.000549	0.0003739	0.0001488
Cu	0.05	0.00058	0.0003950	0.0001571

Most of the above values are expressed as the metals. However, there are two metals, aluminum and iron that have exposure criteria as their oxides.

5.2 EXPOSURE LEVELS FOR VOCS

Peak exposure levels for VOC emissions from hook burn-off operations are shown in Table 18. The emission rates in g/s for hook burn-off (Table 15, Column 3) are shown in Table 15 Column 3. The one hour exposure level (Column 4) for the VOCs were calculated by multiplying the emission rate by the Peak One Hour Exposure level from Table 16, Column 4. The average 24 hour exposure level is shown in Column 5. This value is used to calculate cancer risk. This is the peak exposure levels 87 m from the coating building. Peak exposure levels at the nearest residential area can be determined by multiplying the peak levels by 0.77. It should be noted that this calculated value will overestimate risk since it is based on a peak level that may last only hours whereas the exposure risk is based on a lifetime exposure, and most of the time the exposure would be zero when the wind is not blowing at the nearest residence.

All exposure levels were below the acceptable cancer risk for a lifetime exposure.

TABLE 18: Peak exposure levels for VOCs from gluing, powder coating and hook burning operations.

Material	Community Exposure Limit (risk)	Ave Daily Emission Rate (g/s)	Exposure level for 1 hr ave. (mg/m^3)	Exposure level adjusted for 24 hr ave (mg/m^3)
Benzene	1.00E - 05	0.002	0.00175	0.00088

Based on the daily average exposure, the lifetime risk calculated with the SPREADSHEET TOOL FOR HUMAN HEALTH PRELIMINARY QUANTITATIVE RISK ASSESSMENT (PQRA) is:

Cancer Risk - Inhalation	1.82E-07
Cancer Risk - Total	1.82E-07
Target Cancer Risk:	1.00E-05

5.3 EXPOSURE LEVELS FOR PARTICULATES AND GASES

Peak exposure levels for particulate and gas emissions from hook burning operations are shown in Table 19. The emission rates in g/s hook burn-off are taken from Table 15, Column 3 and are shown in Table 19 Column 3. The one hour exposure level (Column 4) for the particulate and gas emissions were calculated by multiplying the combined Emission Rate by the Peak One Hour Exposure level from Table 16, Column 4. The 24 hour exposure levels are shown in Columns 5 where applicable. These are the peak exposure levels 87 m from the main building for all materials. Peak exposure levels at the nearest residential area can be determined by multiplying the peak levels by 0.77.

All exposure levels were below the exposure limits.

TABLE 19: Peak exposure levels for other emissions from hook burning operations.

Material	**Community Exposure Limit (mg/m^3)**	**Emission Rate (g/s)**	**Exposure level for 1 hr ave. (mg/m^3)**	**Exposure level adjusted for 24 hr ave (mg/m^3)**
Particulates	0.05	0.004	0.0017544	0.0007
SOx	0.275	0.002	0.0008772	0.0003
NOx	0.2	0.02	0.0087720	0.0035
CO	36	0.002	0.0008772	NA

NA = This exposure time does not apply to this material

APPENDIX A - OUTPUT FROM SCREEN3 DISPERSION MODEL

Main Building

```
                    ***  SCREEN3 MODEL RUN  ***
                    *** VERSION DATED 95250 ***

Emissions from Main Bldg

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE              =      VOLUME
   EMISSION RATE (G/S)      =     1.00000
   SOURCE HEIGHT (M)        =      8.0000
   INIT. LATERAL DIMEN (M)  =     29.1000
   INIT. VERTICAL DIMEN (M) =      3.5000
   RECEPTOR HEIGHT (M)      =      1.5000
   URBAN/RURAL OPTION       =       URBAN


BUOY. FLUX =     .000 M**4/S**3;  MOM. FLUX =     .000 M**4/S**2.

                    *** FULL METEOROLOGY ***

               **********************************
               *** SCREEN AUTOMATED DISTANCES ***
               **********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

   DIST     CONC               U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
    (M)   (UG/M**3)    STAB   (M/S)  (M/S)    (M)    HT (M)  Y (M)   Z (M)  DWASH
 -------  ----------   ----   -----  -----  ------   ------  ------  ------  -----
      1.   .0000         0      .0     .0      .0      .00     .00     .00
    100.   580.7         5     1.0    1.0 10000.0     8.00   38.84   10.53   NO
    200.   349.9         5     1.0    1.0 10000.0     8.00   48.26   16.77   NO
    300.   231.7         5     1.0    1.0 10000.0     8.00   57.38   22.42   NO
    400.   166.9         5     1.0    1.0 10000.0     8.00   66.23   27.58   NO
    500.   127.4         5     1.0    1.0 10000.0     8.00   74.81   32.35   NO
    600.   101.5         5     1.0    1.0 10000.0     8.00   83.16   36.80   NO
    700.   83.46         5     1.0    1.0 10000.0     8.00   91.28   40.97   NO
    800.   70.31         5     1.0    1.0 10000.0     8.00   99.19   44.90   NO
    900.   60.38         5     1.0    1.0 10000.0     8.00  106.90   48.63   NO
   1000.   52.67         5     1.0    1.0 10000.0     8.00  114.42   52.18   NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
     64.   681.8         5     1.0    1.0 10000.0     8.00   35.47    8.17   NO

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

********************************
*** SCREEN DISCRETE DISTANCES ***
********************************
```

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
150.	447.0	5	1.0	1.0	10000.0	8.00	43.59	13.73	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	681.8	64.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

Powder Coating Building

```
                    ***  SCREEN3 MODEL RUN  ***
                    *** VERSION DATED 95250 ***

Emissions from New Paint Bldg

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE              =      VOLUME
   EMISSION RATE (G/S)      =     1.00000
   SOURCE HEIGHT (M)        =      9.0000
   INIT. LATERAL DIMEN (M)  =     39.7000
   INIT. VERTICAL DIMEN (M) =      4.3000
   RECEPTOR HEIGHT (M)      =      1.5000
   URBAN/RURAL OPTION       =       URBAN

BUOY. FLUX =    .000 M**4/S**3;  MOM. FLUX =    .000 M**4/S**2.

                    *** FULL METEOROLOGY ***

                 **********************************
                 *** SCREEN AUTOMATED DISTANCES ***
                 **********************************

*** TERRAIN HEIGHT OF   0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC           U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
  (M)    (UG/M**3)  STAB  (M/S)  (M/S)   (M)    HT (M)  Y (M)   Z (M)  DWASH
 -------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
     1.    .0000      0      .0     .0      .0     .00     .00     .00
   100.    417.4      5     1.0    1.0 10000.0    9.00   49.09   11.23    NO
   200.    274.2      5     1.0    1.0 10000.0    9.00   58.19   17.41    NO
   300.    191.0      5     1.0    1.0 10000.0    9.00   67.01   22.99    NO
   400.    142.2      5     1.0    1.0 10000.0    9.00   75.57   28.11    NO
   500.    111.2      5     1.0    1.0 10000.0    9.00   83.90   32.84    NO
   600.    90.13      5     1.0    1.0 10000.0    9.00   92.00   37.26    NO
   700.    75.13      5     1.0    1.0 10000.0    9.00   99.89   41.40    NO
   800.    63.99      5     1.0    1.0 10000.0    9.00  107.59   45.31    NO
   900.    55.45      5     1.0    1.0 10000.0    9.00  115.09   49.02    NO
  1000.    48.74      5     1.0    1.0 10000.0    9.00  122.42   52.55    NO

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     1. M:
    87.    438.6      5     1.0    1.0 10000.0    9.00   47.98   10.44    NO

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*********************************
*** SCREEN DISCRETE DISTANCES ***
*********************************

*** TERRAIN HEIGHT OF   0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
```

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
150.	337.6	5	1.0	1.0	10000.0	9.00	53.68	14.40	NO

DWASH=   MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	438.6	87.	0.

****
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
****

APPENDIX B – OUTPUT FROM PQRA MODEL.

HEALTH CANADA PQRA SPREADSHEET USER INPUT SHEET

User Name:	Elias Occupational Hygiene Consulting	Site:	Hook Burner
Proponent:	MacDon	File #:	
Date:	Swptember 7, 2010	Comment:	

PROBLEM FORMULATION

Potential Land Uses (Yes/No)		Default
Agricultural	No	Yes
Residential/urban parkland	Yes	Yes
Commercial with daycare	No	Yes
Commercial without daycare	No	Yes
Industrial	No	Yes
Recreational	No	Yes
Other	No	No
specify:		

Exposure Scenario		Residential

Receptor Groups (Yes/No)		Default
General public or residents	Yes	Yes
Employees		Yes
Canadian native communities		No
Other		No
specify:		

Operative Pathways (Yes/No)		Default
Inadvertent ingestion of soil		Yes
Inhalation of soil particles		Yes
Inhalation of indoor contaminant vapours		Yes
Inhalation of outdoor contaminant vapours	Yes	Yes
Ingestion of drinking water		Yes
Dermal contact with soil		Yes
Dermal contact with water		Yes
Ingestion of contaminated food		Yes

Site Characteristics		Default
Soil Type		coarse-grained
Significant vehicle traffic on unpaved roads?		No

Active Critical Receptors (Yes/No)		Default
Infant	Yes	Yes
Toddler	Yes	Yes
Child	Yes	Yes
Teen	Yes	Yes
Adult	Yes	Yes
Other	No	No
specify:		

Contaminant Concentrations

Chemical Name	required	Benzene	
Soil (mg/kg)	required	0	
Mole Fraction in Soil (unitless)	optional		
Groundwater - source (mg/L)	optional		
Mole Fraction in Groundwater (unitless)	optional		
Drinking water (mg/L)	optional		
Bathing/swimming water (mg/L)	optional		
Indoor air - vapours (mg/m^3)	optional		
Outdoor air - vapours (mg/m^3)	optional	0.00088	
Outdoor air - particulate (mg/m^3)	optional		
Soil vapours (> 1 m below foundation) (mg/m3)	optional		
Subslab/shallow soil vapour (<1 m) (mg/m3)	optional		
Root vegetables (mg/kg wet weight)	optional		
Other vegetables (mg/kg wet weight)	optional		
Fish (mg/kg wet weight)	optional		
Wild game (mg/kg wet weight)	optional		

Risk Assessment Endpoints

		Default
Acceptable hazard index:		0.2
Acceptable cancer risk:		1.00E-05

SUMMARY OF PQRA RESULTS

Version: July 20, 2007

User Name:	Elias Occupational Hygiene Consulting	**Site:**	
Proponent:	MacDon	**File #:**	
Date:	Swptember 7, 2010	**Comment:**	

		Maximum Hazard/Risk Estimates	
		Benzene	
Hazard Quotient - Oral/Dermal		NA	NA
Hazard Quotient - Inhalation		NA	NA
Hazard Index - Total		NA	NA
Target Hazard Index:	0.2		
Cancer Risk - Oral		NA	NA
Cancer Risk - Dermal		NA	NA
Cancer Risk - Oral + Dermal		NA	NA
Cancer Risk - Inhalation		1.82E-07	NA
Cancer Risk - Total		1.82E-07	NA
Target Cancer Risk:	1.00E-05		

	Critical Receptors	
	Benzene	
Oral/Dermal - non-cancer effects	NA	NA
Inhalation - non-cancer effects	NA	NA
Total - non-cancer effects	NA	NA
Oral - cancer effects	NA	NA
Dermal - cancer effects	NA	NA
Oral + Dermal - cancer effects	NA	NA
Inhalation - cancer effects	Adult	NA
Total - cancer effects	Adult	NA
Source of indoor air vapours	NA	NA

APPENDIX 3 – WASTEWATER ANALYSIS PARTS WASHER

Wastewater Sampling Results

Company: MacDon Industries Ltd

Sample Name: Production Sample

Sample Location: Discharge Tank

Date Sampled: 20-Sep-13

Parameter	Sewer By-Law Limit (mg/L)	Sample Result (mg/L)	Comments
Aldrin / dieldrin	0.0002	<0.002	
Aluminum (total)	50	0.0911	
Antimony (total)	5	0.00292	
Arsenic (total)	1	0.0178	
Benzene	0.5	<0.00050	
Biochemical oxygen demand*	300	76.3	
Cadmium (total)	0.7	0.000102	
Chlordane (cis plus trans isomers)	0.1	<0.002	
Chromium (hexvalent)	2	0.0023	
Chromium (total)	4	0.0046	
Cobalt (total)	5	0.00127	
Copper (total)	2	0.0230	
Cyanide (total)	2	<0.0020	
1,1,2,2 Tetrachloroethane	1.4	<0.00050	
1, 2 - dichlorobenzene	0.05	<0.00050	
1,4 - dichlorobenzene	0.08	<0.00050	
3,3 - dichlorobenzidine	0.002	<0.00050	
Dichlorodiphenyltrichloroethane (DDT)	0.0001	<0.002	
Cis - 1, 2 - dichloroethylene	4	<0.00050	
Ethyl benzene	0.16	<0.00050	
Fluoride	10	9.19	
Hexachlorobenzene	0.0001	<0.00040	
Hexachlorocyclohexane (Lindane)	0.1	<0.001	
Lead (total)	1	0.00495	
Manganese (total)	5	0.141	
Mercury (total)	0.01	<0.00020	
Methylene chloride	2	<0.00050	
Mirex	0.1	<0.001	
Molybdenum (total)	5	0.00634	
Nickel (total)	2	0.0266	
Nitrogen (total)*	60	<1.0	
Nonylphenols	0.02	0.043	Above By-Law Limit
Nonylphenol ethoxylates	0.2	0.416	Above By-Law Limit
Animal or vegetable oil	100	21.5	
Mineral or synthetic oil	15	8.9	

Wastewater Sampling Results

Company: MacDon Industries Ltd

Sample Name: Production Sample

Sample Location: Discharge Tank

Date Sampled: 20-Sep-13

Parameter	Sewer By-Law Limit (mg/L)	Sample Result (mg/L)	Comments
Pentachlorophenol (PCP)	0.01	<0.005	
Phenolics (total by 4AAP method)	1	<0.1	
pH	5.5 to 11	see attached	
Phosphorus (total)*	10	153	Above By-Law Limit
Polychlorinated biphenyls (PCBs)	0.001	<0.00060	
Polycyclic aromatic hydrocarbons (PAHs)	0.005	<0.009	
Selenium (total)	1	<0.0010	
Silver (total)	5	0.00037	
Sulphate (total)	1500	53.6	
Sulphide	1	<0.020	
Suspended Solids (total)*	350	40.0	
Tetrachloroethylene	1	<0.00050	
Tin (total)	5	0.00109	
Titanium (total)	5	0.00491	
Toluene	0.024	<0.00050	
Trichloroethylane	0.4	<0.00050	
Xylenes (total)	1.4	<0.00070	
Zinc (total)	2	0.0447	

Notes: * - Discharges exceeding these limits may be eligible for inclusion into the overstrength wastewater discharge program.

** - Detection limit greater then By-law limit due to matrix effects.

POLLUTION PREVENTION MANUAL SAMPLING LOG SHEET

DATE: 20-Sep-13

COMPANY: MAC DON INDUSTRIES LTD

ADDRESS: 680 MORAY ST

SAMPLE INFORMATION:

6 HOUR MANUAL COMPOSITE

SECOND TREATMENT TANK

TIME (hh:mm)	pH	TEMP (°C)
8:10	6.41	34.6
9:05	6.43	36.2
10:06	6:46	36.0
11:04	6.41	36.1
13:09	6.41	34.2
14:05	6.44	34.6
15:09	6.44	34.4