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CONSULTING ENGINEERS & SCIENTISTS

Draft Report

BBTCA Air Quality Assessment

RWDI # 1010187
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SUBMITTED TO

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1. INTRODUCTION

RWDI AIR Inc. (RWDI) was retained by Dillon Consulting Limited (DCL) on behalf of the Toronto Port Authority (TPA) to conduct an air quality impact assessment in the area of the Billy Bishop Toronto City Airport (BBTCA). RWDI conducted a similar study in 2005 related to the Ferry Passenger Transfer Facilities.[1] In order to assess future air quality impacts in the area of the BBTCA, we have assumed that 202 aircraft slots/day would be used, with passenger volumes of 1.43 million/year in 2010 and 2.56 million/year by 2016. The assessment is intended to provide information about noise impacts related to aircraft movements; ferry service and road traffic in this area for 2010 and 2016.

The objectives of this assessment are to:

- determine the air emissions attributed to the roadway traffic, the passenger ferry and activity at BBTCA under the future scenario (2016) and predict corresponding air contaminant concentrations;
- qualitatively assess air emissions and air contaminant concentrations under the current scenario based on RWDI's previous assessment [completed as part of the Ferry Passenger Transfer Facility project (RWDI, 2005)]; and,
- compare the future and current air contaminant levels to appropriate air quality criteria.

1.1 Study Area

The primary study area includes the lands to the north of the Western Channel, south of the Gardiner Expressway, west of Spadina Avenue and east of the Exhibition Park lands (see Figure 1). Baseline and future residential developments in the area have been considered, as well as park spaces, schools, and other sensitive land uses. Gate and terminal locations at BBTCA are shown in Figure 2.

The receptors selected were based on the previous air quality assessment conducted by RWDI. A site visit to the study area was conducted by RWDI personnel on September 9, 2010. The receptors were confirmed to be representative of the study area. No additional receptors were identified; however, balconies and operable windows at elevated heights were noted. Receptors were added to represent these locations. The receptor locations are provided in Figure 3 and described in Table 1 below.

[1] Potential noise impacts from the operation of a proposed pedestrian tunnel were not included in this assessment as they were considered to be insignificant in the context of the overall noise environment.

Table 1: Modelled Receptor Locations

Receptor No.	Description	Elevation Above Grade (m)
R1	School on southeast corner Queens Quay W. and Bathurst St.	0
R2	School on southeast corner Queens Quay W. and Bathurst St.	0
R3	School on southeast corner Queens Quay W. and Bathurst St.	0
R4	School on southeast corner Queens Quay W. and Bathurst St.	0
R5	Baseball diamond east of Bathurst St.	0
R6	Baseball diamond east of Bathurst St.	0
R7	Baseball diamond east of Bathurst St.	0
R8	Baseball diamond east of Bathurst St.	0
R9	Baseball diamond east of Bathurst St.	0
R10	Baseball diamond east of Bathurst St.	0
R11	Baseball diamond east of Bathurst St.	0
R12	Harbourfront Childcare Centre east of Bathurst St.	0
R13	Little Norway Park west of Bathurst St.	0
R14	Northwest corner of Queens Quay W. and Bathurst St.	0
R15	Northeast corner of Queens Quay W. and Bathurst St.	0
R16	Southwest corner of Queens Quay W. and Bathurst St.	0
R17	Little Norway Park west of Bathurst St.	0
R18	Norway Crescent Residences	0, 7.5
R19	500 Queens Quay W.	0, 31.5
R20	Bishop Tutu Residences	0, 7.5

1.2 Air Quality Contaminants of Interest

The air quality contaminants considered in the assessment were carbon monoxide (CO), oxides of nitrogen (NO_x), inhalable particulate matter (PM_{10}), and respirable particulate matter ($PM_{2.5}$). Emissions of interest for aircraft were CO and NO_x [aircraft emissions of particulate matter are currently not available in the Emission and Dispersion Modelling System (EDMS)]. Roadway emissions were predicted for all of the contaminants. These contaminants were selected because they are commonly used as indicators of air quality in urban areas. Environment Canada and the Ontario Ministry of the Environment (MOE) prescribe targets for the levels of these contaminants, or their constituents, in ambient air. Their effects are described below.

2. AIR QUALITY CRITERIA AND GUIDELINES

The Ontario MOE has established ambient air quality criteria (AAQC), which represent the maximum desirable pollutant levels in the ambient air. These criteria are provided in Table 2 for the principle pollutants associated with vehicles and airport-related activities. Ambient air quality guidelines published by the World Health Organization (WHO) are also included, where there is overlap with the contaminants and averaging times from the AAQC.

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Table 2: Summary of MOE AAQC and World Health Organization (WHO) Guidelines

Pollutant	Averaging Time	Criterion [Guideline]
Carbon Monoxide (CO)	1 hour	36,200 µg/m^3
	8 hours	15,700 µg/m^3
Nitrogen Dioxide (NO_2)	1 hour	400 µg/m^3 [200 µg/m^3]
	24 hour	200 µg/m^3
Volatile Organic Compounds (VOCs)	1 hour	N/A
	24 hours	N/A
Inhalable Particulate Matter (PM_{10})	24 hours	50 µg/m^3 * [50 µg/m^3]
Respirable Particulate Matter ($PM_{2.5}$)	24 hours	30 µg/m^3 [†] [25 µg/m^3]

Notes:

[ ] WHO Guideline
[†] Canada Wide Standard (CWS) by year 2010 based on the 98th percentile ambient measurement annually, averaged over 3 consecutive years.
* Interim Ambient Air Quality Criterion.
N/A no applicable criterion, standard or guideline.

3. HISTORICAL AMBIENT MONITORING RESULTS

Table 3 provides the best available recent information on baseline ambient air quality applicable to the study area.

Table 3: Summary of MOE Ambient Air Quality Monitoring Data (Bay/Wellesley, Station ID #31103) [1,2,3,4,5]

Pollutant	Statistic	2004	2005	2006	2007	2008	Average
CO (µg/m³)	1-hr Max	2192	1835	1685	1962	1073	1749
	8-hr Max	1442	1327	1177	1246	554	1149
	Annual Mean	INS	369	381	231	104	271
	90th Percentile	612	635	588	415	231	496
	Times > 1-hr AAQC (36,200)	0	0	0	0	0	0
	Times > 8-hr AAQC (15,700)	0	0	0	0	0	0
NO_2 (µg/m³)	1-hr Max	149	142	142	142	128	140
	24-hr Max	96	113	85	87	81	92
	Annual Mean	38	39	36	34	32	36
	90th Percentile	68	70	62	62	57	64
	Times > 1-hr AAQC (400)	0	0	0	0	0	0
	Times > 24-hr AAQC (200)	0	0	0	0	0	0
O_3 (µg/m³)	1-hr Max	160	195	180	189	183	181
	24-hr Max	107	123	129	121	129	122
	Annual Mean	44	48	44	50	51	47
	90th Percentile	82	90	82	88	92	87
	Times > 1-hr AAQC (80)	2	36	15	41	24	24
$PM_{2.5}$ TEOM (µg/m³)	1-hr Max	56	65	52	51	43	53
	24-hr Max	37	43	35	41	35	38
	Annual Mean	7	9	7	7	7	7
	90th Percentile	17	21	16	17	15	17
	Times > CWS (30)	8	14	4	6	1	7
PM_{10} TEOM (µg/m³) [1]	1-hr Max	104	120	96	94	80	99
	24-hr Max	69	80	65	76	65	71
	Annual Mean	13	16	14	14	12	14
	90th Percentile	31	39	30	31	28	32
	Times > 24-hr AAQC (50)	INS	INS	INS	INS	INS	

Notes:

[1] PM_{10} is no longer routinely monitored in Ontario. The values were estimated assuming that $PM_{10}=PM_{2.5/0.54}$.
N/A – Not applicable, AAQC does not exist
n/a – Not available

TEOM – Tapered Element Oscillating Microbalance (Continuous Monitor)

INS - Insufficient data to compute relevant statistics

The interim AAQC for ozone is included in the above table because although it is not emitted directly from vehicle exhausts, it is used in predicting the formation of NO_2 from NO_x emissions (see Section 4.3).

4. METHODOLOGY

Air quality impacts from road traffic, ferry operation and airport activities were assessed for 2016. Contaminant concentrations for 2010 were based on the results of RWDI's previous air quality assessment, i.e. the estimates of 2010 concentrations were based on the 2011 scenario from the 2005 assessment. This approach is reasonable for the purposes of this study because – for each of the air contaminants considered – the predicted concentrations estimated for 2011 from the 2005 assessment are expected to be reasonably close (within about 10%) to the concentrations that would have resulted using data now available for key factors such as road traffic and aircraft volumes in 2010. For 2016, the assessment involved the development of an emissions inventory, and dispersion modeling using the US EPA AERMOD dispersion model.

4.1 Emissions Inventory

To develop an emission inventory, the sources were identified and categorized based on the type of activity (i.e. vehicular traffic, aircraft, ground support equipment). Emissions for each category are determined using published emission factors, which relate activity levels to contaminant emissions (e.g. for vehicles, emission factors are available to estimate the mass of contaminants emitted per kilometre travelled by each vehicle). The use of emission factors is the most common method in estimating emissions due to their ease of use and availability.

Aircraft activities and emission factors have been well defined by the U.S. Federal Aviation Administration's (FAA) and the U.S. Air Force. These two organizations jointly developed the Emission and Dispersion Modelling System (EDMS) specifically for air quality assessments at airports. It combines the emissions inventory module with a dispersion module. EDMS Version 5.1.3, the most recent version available, was applied to aircraft and ground support equipment in this assessment [6]. EDMS was used to determine the contaminant emissions from aircraft and ground support equipment (GSE) in use at BBTCA.

4.1.1 Aircraft

Aircraft emissions were calculated for all modes of operation (*i.e.,* takeoff, climb out, approach and idle) at the airport and beyond its boundaries up to an elevation of 3000 feet, which is considered the mixing height for inventory purposes within EDMS. Contaminants emitted below the mixing height become well mixed in the turbulent layer and do not readily penetrate the layer above this height. Contaminants emitted above this height do not become well mixed nor do they readily penetrate the mixed layer to return back to ground level because there is very little turbulence.

The takeoff mode is the time from the start of the ground roll until the aircraft reaches 1000 feet above the surface. The climb out time in mode is the time from 1000 feet to the mixing height. The approach time in mode is the time from the mixing height to the surface [6].

To estimate the emissions from all modes of operation, EDMS requires the user to define the aircraft/engine combinations at the airport since each combination has unique emission characteristics. These data were processed for input to EDMS based on the following assumptions:

- Monthly aircraft movements provided were assumed to be representative of all months of the year.
- The aircraft distributions from the Toronto Port Authority (TPA) assigned 4% and 3% of the activity for current and future scenarios respectively to an aircraft category referred to as "others". This percentage was distributed proportionately across all known aircraft types so that the total movements could be maintained.
- Default engine types were selected for each aircraft, where available.

Annual aircraft movements used for modeling the emissions in 2016 are provided in Table 4.

Table 4: Summary of Annual Aircraft Movements

Design Aircraft [Engine Type]	Current Touch and Go Movements	Current LTOs	Future Touch and Go Movements	Future LTOs
Bombardier de Havilland Dash 8 Q400 [PW150A]	n/a	58,275	n/a	65175
Cessna 172 Skyhawk [IO-360-B]	37,180	12,025	37,180	11850
Cessna 150 [O-200]	37,180	5550	37,180	5925
Sikorsky S-76 Spirit [T700-GE-700]	n/a	4625	n/a	4937
Pilatus PC-12 [PT6A-67]	n/a	2775	n/a	1975
Piper PA-23 Apache/Aztec [TIO-540-J2B2]	n/a	1850	n/a	1975
Cessna 206 [IO-360-B]	n/a	1850	n/a	987
Cessna 182 [IO-360-B]	n/a	925	n/a	987
Raytheon Beech 55 Baron [TIO-540-J2B2]	n/a	925	n/a	987
Total	74,360	88,800	74,360	94,800

It is important to note that the current scenario represent the Year 2010, which was considered as the future scenario in RWDI's 2005 assessment. The total Landing and Take-off (LTOs) cycles at that time were projected to be about 217 per day or about 79,000 per year. The current projections are within about 6% of the original projections for 2010.

Each aircraft/engine combination was assigned to a gate at the terminal. Departure and arrival gates were assumed; however, in our view, this assumption will not have any impact on the results of this assessment.

Hourly operational profiles define the activity/strength of a source over the course of the entire study period on an hour-by-hour basis. Hourly operational profiles as provided by TPA are shown in Table 5. These values were applied to all modelled aircraft types within EDMS.

Table 5: Hourly Operational Profiles

Hour Ending	Percentage of Aircraft Activity %
07:00	1
08:00	3
09:00	4
10:00	6
11:00	6
12:00	7
13:00	7
14:00	7
15:00	8
16:00	8
17:00	8
18:00	8
19:00	8
20:00	7
21:00	5
22:00	4
23:00	3
TOTAL	100%

The latest version of EDMS does not allow the user to enter in taxi and queue time when the dispersion option is selected. Queue and taxi times are calculated internally based on weather condition, which affects runway selection, and aircraft traffic for a particular hour. A number of technical issues were encountered when modeling the taxiways within EDMS. RWDI attempted to contact the FAA, but the technical issues could not be resolved within the time frame of this project. Therefore, it was decided to model the taxiways externally to EDMS using the taxi emission factors within EDMS and an observed taxi time of 3 minutes, as provided by DCL.

Runway selection is a very complicated process that takes into account the wind speed and wind direction, the time of day, location of residences, noise by-laws, etc. EDMS cannot account for all of these complexities; however, it does enable the user to specify the frequency of runway usage. Runway usages were provided by TPA and are summarized below:

Table 6: Runway Utilizations

Runway Number	Percentage (%)
08	34
26	59
06	0
24	1
15	1
33	2
Ramp	3
Total	100

In order to simplify the modelling of taxiways, it was assumed that Runway 08-26 is used 100% of the time. This assumption is reasonable, given that it is used 90% of the time and it is the nearest runway to the receptor locations considered in the assessment.

4.1.2 Ground Support Equipment

Ground support equipment (GSE) services the aircraft while it is at the gate. GSE includes aircraft tugs, cabin service vehicles, catering trucks, water trucks, fuel trucks, lavatory trucks, and baggage tugs. Default assignments based on aircraft type are available in EDMS and were used in this assessment. A summary of all EDMS inputs, including GSE is provided in Appendix A along with the resultant emission inventory.

4.1.3 Roadways

Tailpipe emission factors for CO and NO_x for background traffic in the study area were predicted using MOBILE6.2, which is the most recent version of MOBILE released by the U.S. EPA [7]. MOBILE6.2 predicts average emission rates on a per vehicle per kilometre basis for the predicted spectrum of vehicle types, ages and operating conditions. Vehicle speed and ambient air temperature are also taken into account.

MOBILE6.2 has not been adjusted for any differences between the Canadian and U.S. vehicle fleets, as it is expected that by the year 2010, the differences will be minor [7]. Although Environment Canada has developed a draft Canadian version of the U.S. EPA's MOBILE6.2 model, referred to as MOBILE6.2C, to account for some of the fleet differences that may exist prior to the year 2010; however, the official version has not yet been released to the public. Based on some experimental runs of the draft MOBILE6.2C, RWDI found that there was a negligible difference between the emission factors generated by the original and Canadianized versions of MOBILE6.2. In fact MOBILE6.2 tends to produce higher emission factors compared to the Canadian version. Thus, the official version of MOBILE6.2 was used for this project.

The ambient temperature was set to the daily average value for January in Toronto (approx. -8C) so as to be reflective of cold conditions, when vehicle emissions tend to be at their greatest. The mean vehicle speed, used to calculate vehicle emissions from free flowing traffic during green lights, was set to the posted speed limit of the respective roadway as follows:

- 90 km/h for the Gardiner Expressway;
- 60 km/h for Lakeshore Blvd.;
- 50 km/h for Bathurst Street north of Lakeshore Blvd.; and
- 40 km/h for streets south of Lakeshore (Queens Quay, Stadium Road, Bathurst Street, Spadina Avenue, the fixed link).

In addition to tailpipe emissions, emissions of particulate matter also result from the re-suspension of dust as vehicles travel over a roadway surface. The road dust emissions were calculated based on the draft version of U.S. EPA's AP-42, Chapter 13.2.1, released in June 2010 [8].

$$E=k(sL/2)^{0.98}(W/3)^{0.53}(S/30)^{0.16}$$

Where:
- E = particulate emission factor (g/VMT).
- k = base emission factor for particle size range: for PM_{10} = 7.3, $PM_{2.5}$ = 1.8.
- sL = silt loading (g/m^2), which is dependent on the land use adjacent to the roadway. A value of 0.015 g/m^2 was applied to the Gardiner and Lakeshore Blvd. based on recommendation by MTO/MOE for a previous roadway assessment. A value of 0.1 g/m^2 as provided in AP-42 was applied to all remaining roadways as stated.
- W = average vehicle weight of vehicles travelling the road (tons). As recommended by MTO/MOE for previous roadway assessment, a value of 3 tons was applied.
- S = vehicle speed in miles/hour

The resulting emission factors, averaged over the mix of vehicles present on the roadway, are shown in Table 7**.**

Table 7: Predicted Vehicle Emission Factors for 2016

Scenario Year	Average Vehicle Speed (km/h)	Emission Factor (g/vehicle-mile)			
		CO	NO_X	PM_{10}	$PM_{2.5}$
Future	40	6.89	0.70	0.38	0.10
	50	6.60	0.67	0.39	0.11
	60	6.80	0.67	0.40	0.11
	90	8.46	0.80	0.09	0.03

These emission factors are less than those considered in the 2005 assessment, which were based on the 2010 model year. Emission standards have been implemented that have resulted in significant improvements in vehicle engine and emission control technology. Lower emissions are expected by 2016 as older vehicles are replaced with newer vehicles which are subject to the emission standards.

The following sections of roadway were considered to be sufficient to account for background concentrations attributable to roadways. These are the same roadways that were considered in RWDI's 2005 assessment. DCL provided traffic volumes for the year 2016.

1. Lakeshore Blvd. from Stadium Road to Bathurst Street;
2. Lakeshore Blvd. from Bathurst Street to Spadina Avenue;
3. Bathurst Street from Lakeshore Blvd. to Queens Quay;
4. Bathurst Street from Lakeshore Blvd. to Gardiner Expressway;
5. Bathurst Street from Queens Quay to Lake Ontario;
6. Queens Quay from Stadium Road to Bathurst Street;
7. Queens Quay from Bathurst Street to Spadina Avenue;
8. Gardiner Expressway from West of Spadina Avenue;
9. Spadina Avenue from Queens Quay to Lakeshore Blvd.;
10. Stadium Road from Lakeshore Blvd to Queens Quay; and
11. Stadium Road from Queens Quay to Lake Ontario.

DCL provided PM peak hour volumes and Average Annual Daily Traffic (AADT) volumes. Volumes were derived for each hour of the day (AM Peak and all non-peak hours) by applying a published traffic distribution from the Institute of Transportation Engineers [9]. The traffic volumes are summarized in Table 8. According to data now available, traffic volumes for 2010 (current scenario) are actually about 11% lower than those used as modeling inputs in RWD's 2005 assessment, which were based on projections at the time.

Table 8: Baseline and Projected Traffic Volumes

Roadway Descriptions	Peak Hourly Current	Average Daily Current	Peak Hourly Future	Average Daily Future
Lakeshore Blvd. - Stadium Rd. to Bathurst St.	4600	42500	4950	45500
Lakeshore Blvd. - Bathurst St. to Spadina Rd.	3900	37500	4100	39500
Bathurst Street - Lakeshore Blvd. to Queens Quay	700	7500	1000	10500
Bathurst Street - Lakeshore Blvd. to Gardiner Expressway	2000	20000	2250	22500
Bathurst Street - Queens Quay to Lake Ontario	400	5000	750	8500
Queens Quay - Stadium Rd. to Bathurst St.	350	3500	350	3500
Queens Quay - Bathurst St. to Spadina Ave.	1050	10500	1200	12000
Gardiner Expressway - Bathurst St. to Spadina Ave.	10500	160000	10750	164000
Gardiner Expressway - Bathurst St. to Stadium Rd.	10500	160000	10750	164000
Spadina Avenue - Queens Quay to Lakeshore Blvd.	450	6000	450	6500
Stadium Road - Lakeshore Blvd. to Queens Quay	450	4500	450	4500
Stadium Road - Queens Quay to Lake Ontario	150	2000	150	2000

4.1.4 Ferry Passenger Transfer Facility

Data pertaining to the ferry remained unchanged relative to RWDI's 2005 assessment. At that time, DCL provided engine information for the ferry. The diesel marine engine used by the ferry is referred to a Model 6-71M with 280 BHP (i.e., 209 kW @ 2300 RPM) power rate output. Due to the lack of emission information for this specific engine (6-71M), we referred to US EPA Emission Standards for Marine Diesel Engines [14] by matching up equivalent engine type and output specifications, and applying the EPA future emission rate (Tier 2) to the future year emissions. This is a conservative approach because the emission rates from similar type of engines are lower than the EPA Tier 2 emission rates.

The ferry travel time takes up to 90 seconds to cross the channel, and crosses each way 4 times an hour, so the crossing time of the ferry totals 12 minutes/hour. The unloading and loading of the ferry will take approximately 4 minutes at each end or 16 minutes/hour. There is a committed time of 28 minutes per hour where the ferry is either crossing the channel or loading/unloading. The remaining 32 minutes/hour is when the ferry is queuing/idling. The ferry cycle can vary as demand warrants; as the loads get heavier, the load/unload time may be longer. Typically, the ferry will cross each way 4 times an hour from 6:00 to 23:00 local time; this temporal scheme was used in the modelling. Ferry emissions are highest at the time of queuing/idling, and the emissions from the short-time crossing of the channel are negligible. Table 9 provides the emission rates. The information for the number of crossings and the engine emissions were assumed to remain unchanged from RWDI's 2005 assessment.

Table 9: Emission rates for the Ferry (in g/s)

Operation	Percentage of time (Estimated)	THC	NO_X	CO	PM
Idling north for future	50%	0.23	0.23	0.15	0.01
Idling south for future	50%	0.23	0.23	0.15	0.01

Note: Emission rates based on the EPA future standard for marine vehicles.

4.2 Dispersion Modelling and Analysis

4.2.1 AERMOD Model

The U.S. EPA's AERMOD dispersion modelling system was applied to determine the maximum concentration of CO, NO_x, PM_{10}, and $PM_{2.5}$. The AERMOD dispersion modelling system was jointly developed by the U.S. EPA and the American Meteorological Society (AMS) to replace ISC3 as the regulatory model for short-range transport of pollutants [10]. Air quality impacts from the roadways (including ferry) and airport were modelled cumulatively to assess overall air quality at the receptor locations considered.

4.2.2 Meteorological Data

Hourly surface meteorological data from the BBTCA and upper air data from Buffalo, New York for the years 2000 through 2004 (5 years) were used to represent meteorological conditions near the study area. The Buffalo airport is located about 150 km to the southeast of Toronto and represents the closest station for which upper air data are available. The data were processed using AERMET, the pre-processor used to prepare meteorological data for use in the AERMOD model [11]. AERMET uses meteorological measurements, representative of the modelling domain, to compute certain boundary-layer parameters such as profiles of wind, turbulence, and temperature. Surface parameters are also provided by AERMET to estimate boundary-layer heights and other meteorological parameters. Site characteristics of albedo, surface roughness and Bowen ratio are used by AERMET as these parameters influence the growth and structure of the atmospheric boundary layer. Albedo is a measure of the reflectivity of the surface, surface roughness is related to the height of obstacles to the wind flow, and the Bowen ratio is an indicator of surface moisture levels. These parameters output from AERMET are used by AERMOD. This is the same data set that was applied in RWDI's 2005 assessment.

Figure 5 shows the joint frequency distribution of wind direction and wind speed in a wind rose (a polar histogram format). The orientation of each bar indicates the wind direction where the wind blows from, based on 16 compass points. The length of each bar indicates the frequency of occurrence. The most frequent winds tend to be primarily from the east-northeast at about 13% of the time and from the west at about 9% of the time.

4.3 Ozone Limiting Method

The Ozone Limiting Method (OLM) is a screening-level technique used to estimate the maximum short-term NO_2 concentrations resulting from emissions of NO_X, in order to assess compliance with the MOE's 1-hour AAQC for NO_2. Predicted concentrations of NO_X (calculated by AERMOD) were compared to the maximum 90th percentile ambient ozone (O3) concentration of 47 ppb or 92 $\mu g/m^3$ (2008) from MOE Station #31103 (Bay/Wellesley).

A factor of 0.10 was assumed for the thermal conversion of NO_X to NO_2 for combustion sources. If the remaining concentration of NO_X was less than the concentration of ozone, then it was assumed that 100% of the NO_X was converted to NO_2 according to the following equation:

$$NO_2 = NO_X \text{ for } 0.9NO_X \leq O_3$$

However, if the concentration of NO_X was greater than that of O_3, then O_3 was the limiting factor and the following relationship applied:

$$NO_2 = 0.1NO_X + O_3 \text{ for } 0.9NO_X > O_3$$

It should be noted that this method assumes that the peak NO_2 concentrations occur when adverse dispersion and high O_3 concentrations occur simultaneously, which may be a conservative assumption. The OLM has gained MOE acceptance for the purpose of conducting environmental assessments in Ontario [12].

5. RESULTS & DISCUSSION

The air quality results are presented in terms of the combined impact of cumulative emissions from the roadway, ferry and airport. Predicted maximum 1-hour and 8-hour CO concentrations are presented in Tables 10 and 11. Predicted maximum 1-hour NO_2 concentrations are presented in Table 12. The 24-hour PM_{10} and $PM_{2.5}$ concentrations are presented in Tables 13 and 14.

Table 10: Predicted Maximum 1-Hour CO Concentrations from Combined Roadway, Ferry and Airport Emissions (in $\mu g/m^3$)

Receptor	2010 Predicted Concentration ($\mu g/m^3$)	2016 Predicted Concentration ($\mu g/m^3$)	Reasonable Maximum Background Concentration ($\mu g/m^3$)*	AAQC ($\mu g/m^3$)
R01	2070	1160	496	36,200
R02	2107	1138		
R03	2119	1052		
R04	2131	1015		
R05	2330	819		
R06	2381	848		
R07	2408	855		
R08	2437	840		
R09	2435	832		
R10	2397	828		
R11	2323	826		
R12	2903	722		
R13	2674	788		
R14	1900	1180		
R15	2058	1300		
R16	1992	1160		
R17	2185	809		
R18	2424	718		
R19	1927	868		
R20	2746	1370		

Note: * This value represents the 90th percentile measured concentration. It is considered to be a reasonable worst case concentration because it is only exceeded 10% of the time.

Table 11: Predicted Maximum 8-Hour CO Concentrations from Combined Roadway, Ferry and Airport Emissions (in μg/m^3)

Receptor	2010 Predicted Concentration (μg/m^3)	2016 Predicted Concentration (μg/m^3)	Reasonable Background Concentration (μg/m^3)*	AAQC (μg/m^3)
R01	706	483	496	15,700
R02	715	528		
R03	705	489		
R04	702	461		
R05	808	364		
R06	811	379		
R07	809	390		
R08	798	376		
R09	782	368		
R10	762	364		
R11	746	362		
R12	1,023	313		
R13	811	281		
R14	646	496		
R15	724	532		
R16	679	423		
R17	629	302		
R18	698	269		
R19	697	263		
R20	1, 268	512		

Note: * This value represents the 90th percentile measured concentration. It is considered to be a reasonable worst case concentration because it is only exceeded 10% of the time.

Table 12: Predicted Maximum 1-Hour NO_2 Concentrations from Combined Roadway, Ferry and Airport Emissions (in $\mu g/m^3$)

Receptor	2010 Predicted Concentration ($\mu g/m^3$)	2016 Predicted Concentration ($\mu g/m^3$)	Reasonable Maximum Background Concentration ($\mu g/m^3$)*	AAQC ($\mu g/m^3$)
R01	107	117	64	400
R02	107	117		
R03	106	115		
R04	105	114		
R05	104	115		
R06	104	117		
R07	102	119		
R08	102	118		
R09	102	116		
R10	102	114		
R11	102	112		
R12	112	116		
R13	115	126		
R14	108	124		
R15	111	122		
R16	108	125		
R17	105	124		
R18	100	112		
R19	112	113		
R20	125	108		

Note: * This value represents the 90th percentile measured concentration. It is considered to be a reasonable worst case concentration because it is only exceeded 10% of the time.

Table 13: Predicted Maximum 24-Hour PM_{10} Concentrations from Combined Roadway, Ferry and Airport Emissions (in $\mu g/m^3$)

Receptor	2010 Predicted Concentration ($\mu g/m^3$)	2016 Predicted Concentration ($\mu g/m^3$)	Reasonable Maximum Background Concentration ($\mu g/m^3$)**	AAQC ($\mu g/m^3$)
R01	11.0	21.2	32*	50
R02	12.7	25.5		
R03	10.8	22.2		
R04	9.3	19.6		
R05	6.4	16.7		
R06	6.7	16.0		
R07	7.1	17.2		
R08	6.4	15.3		
R09	5.9	13.9		
R10	5.5	12.9		
R11	5.3	12.3		
R12	5.6	13.8		
R13	5.4	12.0		
R14	9.9	24.1		
R15	14.0	25.2		
R16	9.5	20.2		
R17	5.3	10.4		
R18	3.2	6.0		
R19	9.5	9.4		
R20	8.6	23.6		

Note: * PM_{10} is no longer routinely monitored in Ontario. The value was estimated assuming $PM_{10}=Pm_{2.5/0.54}$

** This value represents the 90th percentile measured concentration. It is considered to be a reasonable worst-case concentration because it is only exceeded 10% of the time.

Table 14: Predicted Maximum 24-Hour $PM_{2.5}$ Concentrations from Combined Roadway, Ferry and Airport Emissions (in $\mu g/m^3$)

Receptor	2010 Predicted Concentration ($\mu g/m^3$)	2016 Predicted Concentration ($\mu g/m^3$)	Reasonable Maximum Background Concentration ($\mu g/m^3$)*	AAQC ($\mu g/m^3$)
R01	1.3	2.7	17	30
R02	1.5	3.1		
R03	1.3	2.8		
R04	1.2	2.6		
R05	1.9	2.5		
R06	1.8	2.7		
R07	1.8	2.7		
R08	1.7	2.5		
R09	1.6	2.3		
R10	1.5	2.2		
R11	1.5	2.1		
R12	2.8	3.1		
R13	3.2	3.5		
R14	1.3	3.2		
R15	1.8	3.2		
R16	1.5	2.7		
R17	1.9	2.8		
R18	2.2	2.8		
R19	1.3	2.5		
R20	1.0	3.3		

Note: * This value represents the 90th percentile measured concentration. It is considered to be a reasonable worst case concentration because it is only exceeded 10% of the time.

The results in the tables indicate that the maximum predicted 1-hour and 8-hour CO concentrations are much less than their respective AAQC. The maximum predicted CO concentrations decrease from 2010 to 2016 at all receptor locations. BBTCA sources are not a significant contributor to local CO concentrations; the major contributor is local road traffic. Traffic volumes projected for 2010 (from RWDI's 2005 assessment) were over-estimated. The corresponding CO concentrations for 2010 are over-estimated as well. For 2016, traffic is projected to increase, but the increase is offset by improved vehicle engine and emission control technology that has been legislated. Emissions will continue to decrease as older vehicles that predate the legislation are replaced. The combination of these factors results in the predicted decrease.

The maximum predicted 1-hour NO_2 concentrations at all receptor locations are less than its respective AAQC. BBTCA sources contribute to maximum NO2 concentrations at locations closer to the BBTCA. Concentrations are predicted to increase at these locations; however, the increase in predicted concentrations between 2010 and 2016 is small relative to the AAQC. The road traffic dominates the maximum predicted 1-hour NO_2 concentrations at receptors farther from the BBTCA (i.e., R20). The maximum concentration decreases for 2016 due to improved vehicle engine and emission control technology that will be realized by 2016 as older vehicles are replaced.

The maximum 24-hour PM_{10} contribution from the modeled sources could possibly result in concentrations above the AAQC if it were to occur at the same time as the maximum background contribution. The predicted PM_{10} concentrations are not attributable to BBTCA activity itself, but rather to activity on the local roadways. The main source of PM from road traffic is dust from the road surface that becomes re-entrained into the air as the tires contact the road surface. PM emissions from the vehicle exhaust are relatively small in comparison. There is a great deal of uncertainty in estimating re-entrained dust from roadway surfaces, and there have been significant refinements in the dust emission estimation techniques since the 2005 assessment. These updates have resulted in higher emissions and predicted concentrations for PM_{10}.

The maximum predicted 24-hour $PM_{2.5}$ concentrations at all receptor locations are less than its respective AAQC. An increase in 24-hour $PM_{2.5}$ concentration is expected across all receptors, but the change is small in comparison to both the background concentrations and the AAQC. Similar to PM_{10}, the predicted increase is not attributable to BBTCA activity, but rather to activity on the local roads, with some contribution from ferry activity, which is not projected to change between 2010 and 2016.

6. CONCLUSIONS

2016 air quality conditions were predicted and compared against air quality criteria to assess the potential for adverse effect. They were also compared to 2010 conditions. The assessment used dispersion modeling techniques to predict the maximum air contaminant contributions from relevant emission sources (local road traffic, BBTCA ferry traffic and BBTCA airport activity), and used historical monitoring data to characterize the contributions from other emission sources in the surrounding area (*i.e.,* background air quality).

For 2010, dispersion model results were taken from previous work that RWDI conducted in 2005, which modeled future air quality conditions reflecting anticipated growth in BBTCA air traffic and associated road traffic, since 2010 was the future year assumed for the 2005 assessment. The use of these previously modeled results to reflect 2010 is reasonable for the purposes of this work, because the assumed BBTCA aircraft and related road traffic volumes were similar to actual 2010 volumes, although erring somewhat on the low side for aircraft volumes, and on the high side for roadway volumes. When comparing the results of the previous modeling to the new modeling for 2016, some exaggeration of the difference between the two was expected to occur because of the changes in estimated traffic volumes and also because of changes in best estimates of emission rates since 2005 (primarily the estimates of particulate matter arising from road dust).

Air contaminant contributions from the modeled emission sources were predicted for a variety of impact locations (*i.e.,* receptors) in the study area (see Figure 5.1 for receptor locations). The maximum predicted contributions of CO, NO_2, PM_{10} and $PM_{2.5}$ at the worst-affected receptors are summarized in Table 15**,** along with applicable ambient air quality criterion (AAQC) and a reasonable estimate of maximum contribution from background emission sources (based on the 90^{th} percentile of historical monitoring data).

Table 15: Summary of Maximum Predicted Concentrations in relation to Air Ambient Quality Criterion

Contaminant	Averaging Period	AAQC (µg/m^3)	Reasonable Maximum Background Concentration (µg/m^3)	2010 Predicted Concentration (µg/m^3)	2016 Predicted Concentration (µg/m^3)
Carbon Monoxide (CO)	1-Hour	36,200	496	2,903	1,960
Nitrogen Dioxide (NO_2)	1-Hour	400	64	125	126
Inhalable Particulate Matter (PM_{10})	24-Hour	50*	32**	14	26
Respirable Particulate Matter ($PM_{2.5}$)	24-Hour	30	17	3.2	3.5

Notes: * Interim Ambient Air Quality Criteria
** PM_{10} is no longer routinely monitored in Ontario. The values were estimated assuming PM_{10}=$PM_{2.5/0.54.}$

The results in the table indicate that the maximum predicted CO concentrations decrease from 2010 to 2016. BBTCA sources are not a significant contributor to local CO concentrations; the major contributor is local road traffic. Traffic volumes projected for 2010 (from RWDI's 2005 assessment) were over-estimated. The corresponding CO concentrations for the current scenario are over-estimated as well. For 2016, traffic is projected to increase, but the increase is offset by improved vehicle engine and emission control technology that has been legislated. Emissions will continue to decrease as older vehicles that predate the legislation are replaced. The combination of these factors results in the predicted decrease.

BBTCA sources contribute to maximum NO_2 concentrations at locations closer to the BBTCA. Unlike vehicles, no improvements in emission control technology for aircraft engines are expected between 2010 and 2016. At locations further away from BBTCA, NO_2 concentrations are more influenced by local road traffic.

PM_{10} and $PM_{2.5}$ concentrations are dominated by road traffic. The maximum concentrations are predicted to increase from 2010 to 2016, but those increases are highly overestimated, especially for PM_{10}. The main source of PM from road traffic is dust from the road surface that becomes re-entrained into the air as the tires contact the road surface. PM emissions from the vehicle exhaust are relatively small in comparison. There is a great deal of uncertainty in estimating re-entrained dust from roadway surfaces, and there have been significant refinements in the dust emission estimation techniques since the 2005 assessment. These updates have resulted in higher emissions and predicted concentrations, especially for PM_{10}.

In general, it can be seen that the contributions from the modeled emission sources and the predicted changes between 2010 and 2016 conditions are small in relation to the applicable criteria and have little bearing on whether the AAQC is met. A possible exception is PM10, for which the maximum contribution from the modeled sources could possibly cause concentrations above the AAQC if it were to occur at the same time as the maximum background contribution. There is, however, some uncertainty associated with both the predicted concentrations and the reasonable maximum background concentrations, as these levels were estimated. The predicted PM_{10} concentrations are not attributable to BBTCA activity itself, but rather to activity on the local roadways, as well as the ferry service, which will not change from 2010 to 2016.

Therefore, we conclude that expected activity at BBTCA will not result in adverse effects in local air quality overall. In general, concentrations of air contaminants in the study area are typical of the levels one would expect in an urban area in Toronto near a major highway.

7. REFERENCES

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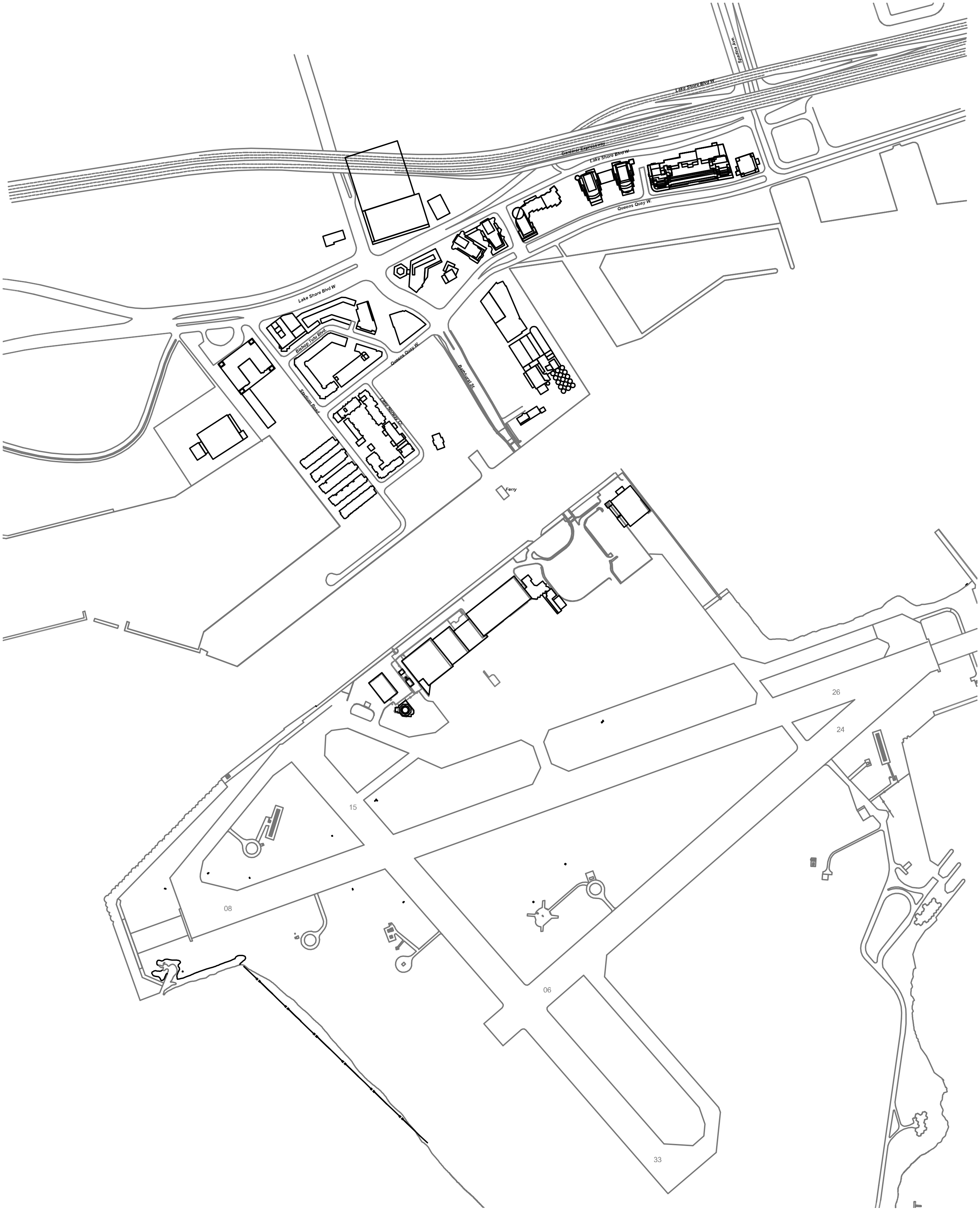
FIGURES

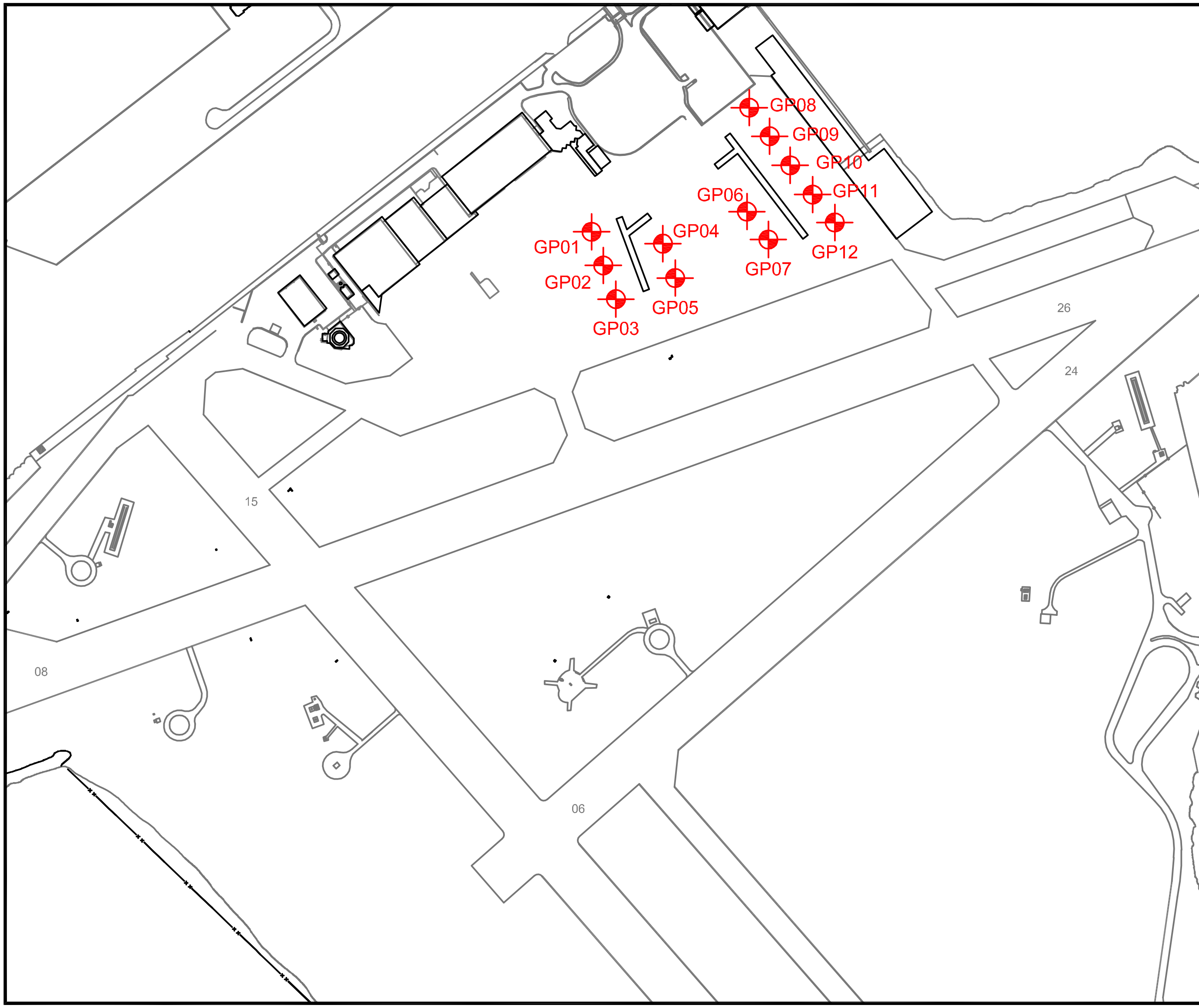


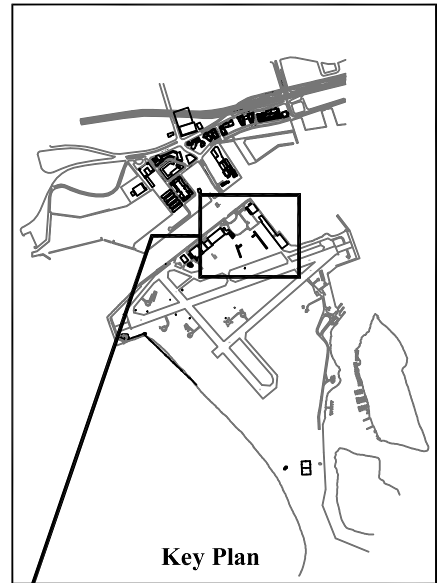
Study Area

True North

Drawn by: KAR	Figure: 1	RWDI
Approx. Scale:	1:8000	
Date Revised:	Oct. 13, 2010	

Pedestrian Tunnel, Billy Bishop Toronto City Airport - Toronto, Ontario Project #1010187





2010 & 2016 FPTF and Gate Locations (GP)	True North	Drawn by: KAR	Figure: **2**
		Approx. Scale: 1:6000	
Pedestrian Tunnel, Billy Bishop Toronto City Airport - Toronto, Ontario	Project #1010187	Date Revised: Nov. 15, 2010	

RWDI

Location of Modelled Receptors (R)

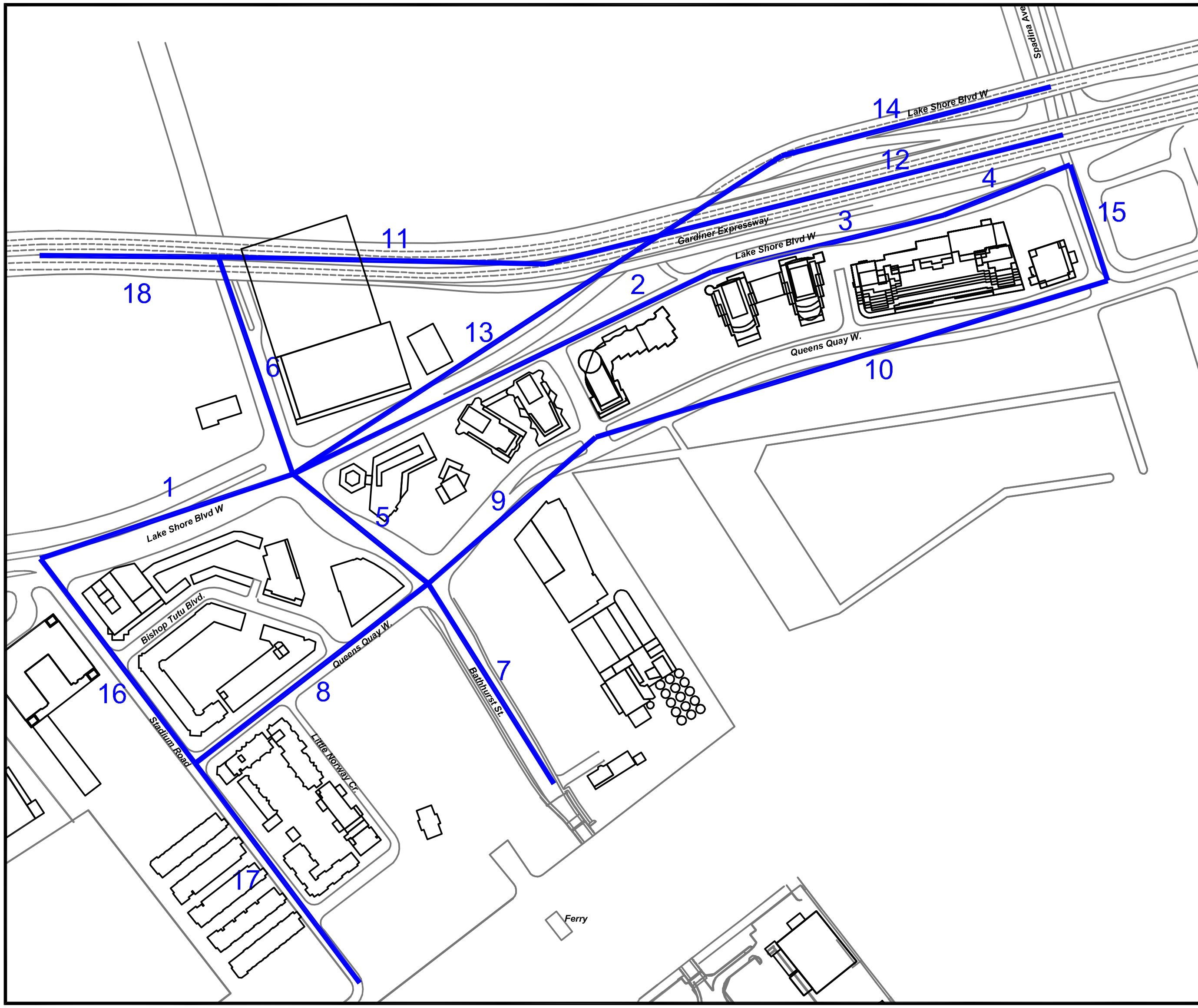
True North

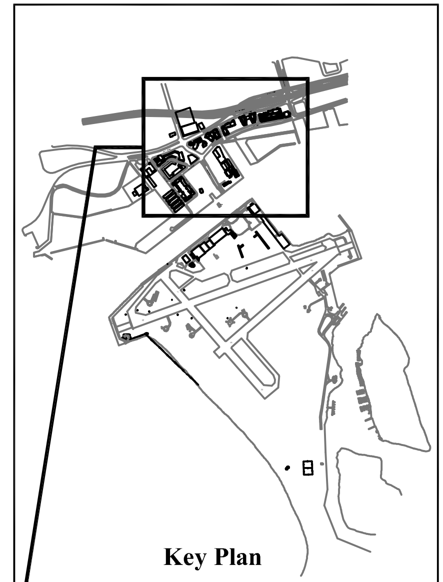
Pedestrian Tunnel, Billy Bishop Toronto City Airport - Toronto, Ontario

Project #1010187

Drawn by: KAR	Figure: 3
Approx. Scale:	1:3000
Date Revised:	Oct. 13, 2010

RWDI





Location of Modelled Roadway Links

Pedestrian Tunnel, Billy Bishop Toronto City Airport - Toronto, Ontario

Project #1010187

True North

Drawn by: KAR	Figure: 4
Approx. Scale:	1:5000
Date Revised:	Oct. 13, 2010

RWDI

APPENDIX A

EDMS 5.1.2 Model Inputs for BBTCAv3 Study

Study Created:	Mon Jul 19 10:06:47 2010
Report Date:	Tue Oct 19 13:24:07 2010
Study Pathname:	C:\Users\ss\Desktop\BBTCAv3\BBTCAv3.edm

Study Setup

Unit System:	Metric
Dispersion Modeling:	Dispersion is enabled for this study
Speciated Organic Gas (OG) Modeling:	Speciated Organic Gas (OG) Emissions are excluded from this study.
Analysis Years:	2016

Scenarios

Scenario Name:	Description:	Add a description.
Baseline	Aircraft Times in Mode Basis:	Performance-Based
	Taxi Time Modeling:	Delay & Sequencing Model
	FOA3 Sulfur-to-Sulfate Conversion Rate:	2.400000 %

Airports

Airport Name:	City Centre
IATA Code:	YTZ
ICAO Code:	CYTZ
FAA Code:	
Country:	CA
State:	Ontario
City:	Toronto Island
Airport Description:	City Centre
Latitude:	43.627°
Longitude:	-79.396°
Northing:	4831751.07
Easting:	629393.00
UTM Zone:	17
Elevation:	251.00 feet
PM Modeling Methodology:	FOA3

Scenario-Airport: Baseline, City Centre

Weather

Baseline, City Centre

Mixing Height:	914.40 meters
Temperature:	8.64 °C
Daily High Temperature:	14.39 °C
Daily Low Temperature:	2.89 °C
Pressure:	100711.18 Pa
Sea Level Pressure:	101659.37 Pa
Relative Humidity:	74.05
Wind Speed:	17.21 kph
Wind Direction:	0.00 °
Ceiling:	30480.00 m
Visibility:	80.47 km

The user has used hourly meteorological data.

Base Elevation:	76.50 meters
Date Range:	Saturday, January 01, 2000 to Friday, December 31, 2004
Source Data File Location:	
Upper Air Data File Location:	

Quarter-Hourly Operational Profiles

Baseline, City Centre

Name: DEFAULT

Quarter-Hour	Weight	Quarter-Hour	Weight	Quarter-Hour	Weight	Quarter-Hour	Weight
12:00am to 12:14 am	1.000000	6:00am to 6:14am	1.000000	12:00pm to 12:14 pm	1.000000	6:00pm to 6:14pm	1.000000
12:15am to 12:29 am	1.000000	6:15am to 6:29am	1.000000	12:15pm to 12:29 pm	1.000000	6:15pm to 6:29pm	1.000000
12:30am to 12:44 am	1.000000	6:30am to 6:44am	1.000000	12:30pm to 12:44 pm	1.000000	6:30pm to 6:44pm	1.000000
12:45am to 12:59 am	1.000000	6:45am to 6:59am	1.000000	12:45pm to 12:59 pm	1.000000	6:45pm to 6:59pm	1.000000
1:00am to 1:14am	1.000000	7:00am to 7:14am	1.000000	1:00pm to 1:14pm	1.000000	7:00pm to 7:14pm	1.000000
1:15am to 1:29am	1.000000	7:15am to 7:29am	1.000000	1:15pm to 1:29pm	1.000000	7:15pm to 7:29pm	1.000000
1:30am to 1:44am	1.000000	7:30am to 7:44am	1.000000	1:30pm to 1:44pm	1.000000	7:30pm to 7:44pm	1.000000
1:45am to 1:59am	1.000000	7:45am to 7:59am	1.000000	1:45pm to 1:59pm	1.000000	7:45pm to 7:59pm	1.000000
2:00am to 2:14am	1.000000	8:00am to 8:14am	1.000000	2:00pm to 2:14pm	1.000000	8:00pm to 8:14pm	1.000000
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5:30am to 5:44am	1.000000	11:30am to 11:44am	1.000000	5:30pm to 5:44pm	1.000000	11:30pm to 11:44pm	1.000000
5:45am to 5:59am	1.000000	11:45am to 11:59am	1.000000	5:45pm to 5:59pm	1.000000	11:45pm to 11:59pm	1.000000

Name: Qrtr-Hrly Profile

Quarter-Hour	Weight	Quarter-Hour	Weight	Quarter-Hour	Weight	Quarter-Hour	Weight
12:00am to 12:14 am	0.000000	6:00am to 6:14am	0.125000	12:00pm to 12:14 pm	0.875000	6:00pm to 6:14pm	1.000000
12:15am to 12:29 am	0.000000	6:15am to 6:29am	0.125000	12:15pm to 12:29 pm	0.875000	6:15pm to 6:29pm	1.000000
12:30am to 12:44 am	0.000000	6:30am to 6:44am	0.125000	12:30pm to 12:44 pm	0.875000	6:30pm to 6:44pm	1.000000
12:45am to 12:59 am	0.000000	6:45am to 6:59am	0.125000	12:45pm to 12:59 pm	0.875000	6:45pm to 6:59pm	1.000000
1:00am to 1:14am	0.000000	7:00am to 7:14am	0.375000	1:00pm to 1:14pm	0.875000	7:00pm to 7:14pm	0.875000
1:15am to 1:29am	0.000000	7:15am to 7:29am	0.375000	1:15pm to 1:29pm	0.875000	7:15pm to 7:29pm	0.875000
1:30am to 1:44am	0.000000	7:30am to 7:44am	0.375000	1:30pm to 1:44pm	0.875000	7:30pm to 7:44pm	0.875000
1:45am to 1:59am	0.000000	7:45am to 7:59am	0.375000	1:45pm to 1:59pm	0.875000	7:45pm to 7:59pm	0.875000
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2:15am to 2:29am	0.000000	8:15am to 8:29am	0.500000	2:15pm to 2:29pm	1.000000	8:15pm to 8:29pm	0.625000
2:30am to 2:44am	0.000000	8:30am to 8:44am	0.500000	2:30pm to 2:44pm	1.000000	8:30pm to 8:44pm	0.625000
2:45am to 2:59am	0.000000	8:45am to 8:59am	0.500000	2:45pm to 2:59pm	1.000000	8:45pm to 8:59pm	0.625000
3:00am to 3:14am	0.000000	9:00am to 9:14am	0.750000	3:00pm to 3:14pm	1.000000	9:00pm to 9:14pm	0.500000
3:15am to 3:29am	0.000000	9:15am to 9:29am	0.750000	3:15pm to 3:29pm	1.000000	9:15pm to 9:29pm	0.500000
3:30am to 3:44am	0.000000	9:30am to 9:44am	0.750000	3:30pm to 3:44pm	1.000000	9:30pm to 9:44pm	0.500000
3:45am to 3:59am	0.000000	9:45am to 9:59am	0.750000	3:45pm to 3:59pm	1.000000	9:45pm to 9:59pm	0.500000
4:00am to 4:14am	0.000000	10:00am to 10:14am	0.750000	4:00pm to 4:14pm	1.000000	10:00pm to 10:14pm	0.375000
4:15am to 4:29am	0.000000	10:15am to 10:29am	0.750000	4:15pm to 4:29pm	1.000000	10:15pm to 10:29pm	0.375000
4:30am to 4:44am	0.000000	10:30am to 10:44am	0.750000	4:30pm to 4:44pm	1.000000	10:30pm to 10:44pm	0.375000
4:45am to 4:59am	0.000000	10:45am to 10:59am	0.750000	4:45pm to 4:59pm	1.000000	10:45pm to 10:59pm	0.375000

5:00am to 5:14am	0.000000	11:00am to 11:14am	0.875000	5:00pm to 5:14pm	1.000000	11:00pm to 11:14pm	0.000000
5:15am to 5:29am	0.000000	11:15am to 11:29am	0.875000	5:15pm to 5:29pm	1.000000	11:15pm to 11:29pm	0.000000
5:30am to 5:44am	0.000000	11:30am to 11:44am	0.875000	5:30pm to 5:44pm	1.000000	11:30pm to 11:44pm	0.000000
5:45am to 5:59am	0.000000	11:45am to 11:59am	0.875000	5:45pm to 5:59pm	1.000000	11:45pm to 11:59pm	0.000000

Daily Operational Profiles

Baseline, City Centre

Name: DEFAULT

Day	Weight	Day	Weight
Monday	1.000000	Friday	1.000000
Tuesday	1.000000	Saturday	1.000000
Wednesday	1.000000	Sunday	1.000000
Thursday	1.000000		

Name: Daily Profile

Day	Weight	Day	Weight
Monday	1.000000	Friday	1.000000
Tuesday	1.000000	Saturday	1.000000
Wednesday	1.000000	Sunday	1.000000
Thursday	1.000000		

Monthly Operational Profiles

Baseline, City Centre

Name: DEFAULT

Month	Weight	Month	Weight
January	1.000000	July	1.000000
February	1.000000	August	1.000000
March	1.000000	September	1.000000
April	1.000000	October	1.000000
May	1.000000	November	1.000000
June	1.000000	December	1.000000

Aircraft

Baseline, City Centre

Default Taxi Out Time: 19.000000 min
Default Taxi In Time: 7.000000 min

Year:	Uses Schedule?	Schedule Filename:
2016	No	(None)

Aircraft Name:
Bombardier de Havilland Dash 8 Q400
Engine Type:
PW150A
Identification:
#1
Category:
LCTP

Take Off weight:	17554.00 Kgs
Approach Weight:	17146.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 3

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Aircraft Tractor (Stewart & Stevenson TUG MC)	Diesel	0.00	5.00	86.00	80.00	
Baggage Tractor (Stewart & Stevenson TUG MA 50)	Gasoline	17.00	18.00	107.00	55.00	
Belt Loader (Stewart & Stevenson TUG 660)	Gasoline	15.00	15.00	107.00	50.00	

Cabin Service Truck (Hi-Way / TUG 660 chasis)	Diesel	5.00	5.00	71.00	53.00	
Catering Truck (Hi-Way / TUG 660 chasis)	Diesel	5.00	5.00	71.00	53.00	
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	20.00	175.00	25.00	
Ground Power Unit (TLD, 28 VDC)	Diesel	0.00	40.00	71.00	75.00	
Lavatory Truck (TLD 1410)	Diesel	15.00	0.00	56.00	25.00	
Service Truck (F250 / F350)	Diesel	7.00	8.00	235.00	20.00	

Year:
2016

Annual Departures:	16293
Annual Arrivals:	16293
Annual TGOs:	0
Taxi Out Time:	Determined by Sequencing model
Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name:
Bombardier de Havilland Dash 8 Q400
Engine Type:
PW150A
Identification:
#2
Category:
LCTP

Take Off weight:	17554.00 Kgs
Approach Weight:	17146.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 5

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Aircraft Tractor (Stewart & Stevenson TUG MC)	Diesel	0.00	5.00	86.00	80.00	
Baggage Tractor (Stewart & Stevenson TUG MA 50)	Gasoline	17.00	18.00	107.00	55.00	
Belt Loader (Stewart & Stevenson TUG 660)	Gasoline	15.00	15.00	107.00	50.00	
Cabin Service Truck (Hi-Way / TUG 660 chasis)	Diesel	5.00	5.00	71.00	53.00	
Catering Truck (Hi-Way / TUG 660 chasis)	Diesel	5.00	5.00	71.00	53.00	
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	20.00	175.00	25.00	
Ground Power Unit (TLD, 28 VDC)	Diesel	0.00	40.00	71.00	75.00	
Lavatory Truck (TLD 1410)	Diesel	15.00	0.00	56.00	25.00	
Service Truck (F250 / F350)	Diesel	7.00	8.00	235.00	20.00	

Year: 2016	Annual Departures:	16294
	Annual Arrivals:	16294
	Annual TGOs:	0
	Taxi Out Time:	Determined by Sequencing model
	Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name:
Bombardier de Havilland Dash 8 Q400
Engine Type:
PW150A
Identification:
#3
Category:
LCTP

Take Off weight:	17554.00 Kgs
Approach Weight:	17146.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 7

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Aircraft Tractor (Stewart & Stevenson TUG MC)	Diesel	0.00	5.00	86.00	80.00	
Baggage Tractor (Stewart & Stevenson TUG MA 50)	Gasoline	17.00	18.00	107.00	55.00	
Belt Loader (Stewart & Stevenson TUG 660)	Gasoline	15.00	15.00	107.00	50.00	
Cabin Service Truck (Hi-Way / TUG 660 chasis)	Diesel	5.00	5.00	71.00	53.00	
Catering Truck (Hi-Way / TUG 660 chasis)	Diesel	5.00	5.00	71.00	53.00	
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	20.00	175.00	25.00	
Ground Power Unit (TLD, 28 VDC)	Diesel	0.00	40.00	71.00	75.00	
Lavatory Truck (TLD 1410)	Diesel	15.00	0.00	56.00	25.00	
Service Truck (F250 / F350)	Diesel	7.00	8.00	235.00	20.00	

Year: 2016	Annual Departures:	16294
	Annual Arrivals:	16294
	Annual TGOs:	0
	Taxi Out Time:	Determined by Sequencing model
	Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT

Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name:
Bombardier de Havilland Dash 8 Q400
Engine Type:
PW150A
Identification:
#4
Category:
LCTP

Take Off weight:	17554.00 Kgs
Approach Weight:	17146.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 12

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Aircraft Tractor (Stewart & Stevenson TUG MC)	Diesel	0.00	5.00	86.00	80.00	
Baggage Tractor (Stewart & Stevenson TUG MA 50)	Gasoline	17.00	18.00	107.00	55.00	
Belt Loader (Stewart & Stevenson TUG 660)	Gasoline	15.00	15.00	107.00	50.00	
Cabin Service Truck (Hi-Way / TUG 660 chasis)	Diesel	5.00	5.00	71.00	53.00	
Catering Truck (Hi-Way / TUG 660 chasis)	Diesel	5.00	5.00	71.00	53.00	
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	20.00	175.00	25.00	
Ground Power Unit (TLD, 28 VDC)	Diesel	0.00	40.00	71.00	75.00	
Lavatory Truck (TLD 1410)	Diesel	15.00	0.00	56.00	25.00	
Service Truck (F250 / F350)	Diesel	7.00	8.00	235.00	20.00	

Year:
2016

Annual Departures:	16294
Annual Arrivals:	16294
Annual TGOs:	0
Taxi Out Time:	Determined by Sequencing model
Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name:
Cessna 150 Series
Engine Type:
O-200
Identification:
#1
Category:
SGPP

Take Off weight:	998.00 Kgs
Approach Weight:	898.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min

Gate Assignment: Gate 7

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	10.00	175.00	25.00	

Year:
2016

Annual Departures: 5925
Annual Arrivals: 5925
Annual TGOs: 0
Taxi Out Time: Determined by Sequencing model
Taxi In Time: Determined by Sequencing model

Departure Quarter-Hourly Operational profile: Qrtr-Hrly Profile
Departure Daily Operational Profile: DEFAULT
Departure Monthly Operational Profile: DEFAULT
Arrival Quarter-Hourly Operational profile: Qrtr-Hrly Profile
Arrival Daily Operational Profile: DEFAULT
Arrival Monthly Operational Profile: DEFAULT
Touch & Go Quarter-Hourly Operational profile: Qrtr-Hrly Profile
Touch & Go Daily Operational Profile: DEFAULT
Touch & Go Monthly Operational Profile: DEFAULT

Aircraft Name:
Cessna 150 Series
Engine Type:
O-200
Identification:
#2
Category:
SGPP

Take Off weight: 998.00 Kgs
Approach Weight: 898.00 Kgs
Glide Slope: 3.00°
APU Assignment: None
APU Departure OP Time: 13.00 min
APU Arrival OP Time: 13.00 min
Gate Assignment: Gate 10

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	10.00	175.00	25.00	

Year:
2016

Annual Departures: 0
Annual Arrivals: 0
Annual TGOs: 37180
Taxi Out Time: Determined by Sequencing model
Taxi In Time: Determined by Sequencing model

Departure Quarter-Hourly Operational profile: Qrtr-Hrly Profile
Departure Daily Operational Profile: DEFAULT
Departure Monthly Operational Profile: DEFAULT
Arrival Quarter-Hourly Operational profile: Qrtr-Hrly Profile
Arrival Daily Operational Profile: DEFAULT
Arrival Monthly Operational Profile: DEFAULT
Touch & Go Quarter-Hourly Operational profile: Qrtr-Hrly Profile
Touch & Go Daily Operational Profile: DEFAULT
Touch & Go Monthly Operational Profile: DEFAULT

Aircraft Name:
Cessna 172 Skyhawk
Engine Type:
IO-360-B
Identification:
#1
Category:
SGPP

Take Off weight:	1111.00 Kgs
Approach Weight:	1111.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 10

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	10.00	175.00	25.00	

Year:
2016

Annual Departures:	11850
Annual Arrivals:	11850
Annual TGOs:	0
Taxi Out Time:	Determined by Sequencing model
Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name:
Cessna 172 Skyhawk
Engine Type:
IO-360-B
Identification:
#2
Category:
SGPP

Take Off weight:	1111.00 Kgs
Approach Weight:	1111.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 3

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	10.00	175.00	25.00	

Year:
2016

Annual Departures:	0
Annual Arrivals:	0
Annual TGOs:	37180
Taxi Out Time:	Determined by Sequencing model
Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT

Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name:
Cessna 182
Engine Type:
IO-360-B
Identification:
#1
Category:
SGPP

Take Off weight:	1270.00 Kgs
Approach Weight:	1270.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 5

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	10.00	175.00	25.00	

Year:
2016

Annual Departures:	988
Annual Arrivals:	988
Annual TGOs:	0
Taxi Out Time:	Determined by Sequencing model
Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name:
Cessna 206
Engine Type:
IO-360-B
Identification:
#1
Category:
SGPP

Take Off weight:	1361.00 Kgs
Approach Weight:	1225.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 7

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	10.00	175.00	25.00	

Year:
2016

Annual Departures:	988

Annual Arrivals:	988
Annual TGOs:	0
Taxi Out Time:	Determined by Sequencing model
Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name:
Pilatus PC-12
Engine Type:
PT6A-67
Identification:
#1
Category:
SGTP

Take Off weight:	998.00 Kgs
Approach Weight:	898.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 10

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Aircraft Tractor (Stewart & Stevenson TUG MC)	Diesel	0.00	5.00	86.00	80.00	
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	20.00	175.00	25.00	
Ground Power Unit (TLD)	Gasoline	0.00	40.00	107.00	75.00	

Year:
2016

Annual Departures:	1975
Annual Arrivals:	1975
Annual TGOs:	0
Taxi Out Time:	Determined by Sequencing model
Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name:
Piper PA-23 Apache/Aztec
Engine Type:
TIO-540-J2B2
Identification:
#1

Take Off weight:	2495.00 Kgs
Approach Weight:	2495.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None

Category: SGPB

APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 12

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	10.00	175.00	25.00	

Year: 2016

Annual Departures:	1975
Annual Arrivals:	1975
Annual TGOs:	0
Taxi Out Time:	Determined by Sequencing model
Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name: Raytheon Beech 55 Baron
Engine Type: TIO-540-J2B2
Identification: #1
Category: SGPB

Take Off weight:	2495.00 Kgs
Approach Weight:	2495.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 5

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year
Fuel Truck (F750, Dukes Transportation Services, DART 3000 to 6000 gallon)	Diesel	0.00	10.00	175.00	25.00	

Year: 2016

Annual Departures:	988
Annual Arrivals:	988
Annual TGOs:	0
Taxi Out Time:	Determined by Sequencing model
Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Touch & Go Daily Operational Profile:	DEFAULT

Touch & Go Monthly Operational Profile:	DEFAULT

Aircraft Name:
Sikorsky S-76 Spirit
Engine Type:
T700-GE-700
Identification:
#1
Category:
SGTH

Take Off weight:	4536.00 Kgs
Approach Weight:	4536.00 Kgs
Glide Slope:	3.00°
APU Assignment:	None
APU Departure OP Time:	13.00 min
APU Arrival OP Time:	13.00 min
Gate Assignment:	Gate 3

Assigned GSE/AGE:	FUEL	Arrival Op Time (mins)	Departure Op Time (mins)	Horsepower (hp)	Load Factor (%)	Manufactured Year

Year:
2016

Annual Departures:	4938
Annual Arrivals:	4938
Annual TGOs:	0
Taxi Out Time:	Determined by Sequencing model
Taxi In Time:	Determined by Sequencing model

Departure Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Departure Daily Operational Profile:	DEFAULT
Departure Monthly Operational Profile:	DEFAULT
Arrival Quarter-Hourly Operational profile:	Qrtr-Hrly Profile
Arrival Daily Operational Profile:	DEFAULT
Arrival Monthly Operational Profile:	DEFAULT
Touch & Go Quarter-Hourly Operational profile:	DEFAULT
Touch & Go Daily Operational Profile:	DEFAULT
Touch & Go Monthly Operational Profile:	DEFAULT

GSE Population
Baseline, City Centre

None.

Parking Facilities
Baseline, City Centre

None.

Roadways
Baseline, City Centre

None.

Stationary Sources
Baseline, City Centre

None.

Training Fires
Baseline, City Centre

None.

Gates
Baseline, City Centre

Gate Name:
Gate 10

Elevation:	76.50 meters	
Release Height:	1.50 meters	
Initial Sigma-Z:	3.00 meters	
Initial Sigma-Y:	16.00 meters	
Point:	X (meters)	Y (meters)
1	80.40	-212.70

Gate Name:
Gate 12

Elevation:	76.50 meters
Release Height:	1.50 meters
Initial Sigma-Z:	3.00 meters
Initial Sigma-Y:	16.00 meters

	Point:	X (meters)	Y (meters)
	1	121.10	-265.00

Gate Name: Gate 3	Elevation:	76.50 meters	
	Release Height:	1.50 meters	
	Initial Sigma-Z:	3.00 meters	
	Initial Sigma-Y:	16.00 meters	
	Point:	X (meters)	Y (meters)
	1	-78.80	-335.00

Gate Name: Gate 5	Elevation:	76.50 meters	
	Release Height:	1.50 meters	
	Initial Sigma-Z:	3.00 meters	
	Initial Sigma-Y:	16.00 meters	
	Point:	X (meters)	Y (meters)
	1	-24.70	-315.80

Gate Name: Gate 7	Elevation:	76.50 meters	
	Release Height:	1.50 meters	
	Initial Sigma-Z:	3.00 meters	
	Initial Sigma-Y:	16.00 meters	
	Point:	X (meters)	Y (meters)
	1	60.40	-280.50

Taxiways

Baseline, City Centre

Taxiway Name: Gate 10 to Gate 12	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	80.40	-212.70	76.50	17.26
	2	121.10	-265.00	76.50	

Taxiway Name: Gate 12 - Gate 10	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	121.10	-265.00	76.50	17.26
	2	80.40	-212.70	76.50	

Taxiway Name: Gate 12 - TG5	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	121.10	-265.00	76.50	17.26
	2	-24.70	-315.80	76.50	

Taxiway Name: Gate 3-TG5	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	-78.80	-335.00	76.50	17.26
	2	-24.70	-315.80	76.50	

Taxiway Name: Gate 7 - TG5	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	60.40	-280.50	76.50	17.26
	2	-24.70	-315.80	76.50	

Taxiway Name: R24,26-TG5	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	481.60	-286.30	76.50	17.26
	2	-24.70	-315.80	76.50	

Taxiway Name: R8-TG5	Width:	20.00 (meters)

	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	-668.00	-698.70	76.50	17.26
	2	-24.70	-315.80	76.50	

Taxiway Name:					
TG5-Gate 12	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	-24.70	-315.80	76.50	17.26
	2	121.10	-265.00	76.50	

Taxiway Name:					
TG5-Gate 3	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	-24.70	-315.80	76.50	17.26
	2	-78.80	-335.00	76.50	

Taxiway Name:					
TG5-Gate7	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	-24.70	-315.80	76.50	17.26
	2	60.40	-280.50	76.50	

Taxiway Name:					
TG5-R08	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	-24.70	-315.80	76.50	17.26
	2	-668.00	-698.70	76.50	

Taxiway Name:					
TG5-R2426	Width:	20.00 (meters)			
	Point:	X (meters)	Y (meters)	Elevation (meters)	Speed (mph)
	1	-24.70	-315.80	76.50	17.26
	2	481.60	-286.30	76.50	

Runways

Baseline, City Centre

Runway Name:	Name:	X (meters)	Y (meters)	Elevation (meters)	Glide Slope (°)
8	8	-668.00	-698.70	76.50	3.00

Runway Name:	Name:	X (meters)	Y (meters)	Elevation (meters)	Glide Slope (°)
26	26	481.60	-286.30	76.50	3.00

Taxipaths

Baseline, City Centre

Direction:	Gate:	Runway:	Runway Exit:	Taxiways:
Outbound	Gate 10	8		Gate 10 to Gate 12 Gate 12 - TG5 TG5-R08

Direction:	Gate:	Runway:	Runway Exit:	Taxiways:
Inbound	Gate 10	8	R8-TG5	R8-TG5 TG5-Gate 12 Gate 12 - Gate 10

Direction:	Gate:	Runway:	Runway Exit:	Taxiways:
Outbound	Gate 10	26		Gate 10 to Gate 12 Gate 12 - TG5 TG5-R2426

Direction:	Gate:	Runway:	Runway Exit:	Taxiways:
Inbound	Gate 10	26	R24,26-TG5	R24,26-TG5 TG5-Gate 12 Gate 12 - Gate 10

Direction:	Gate:	Runway:	Runway Exit:	Taxiways:
Outbound	Gate 12	8		Gate 12 - TG5 TG5-R08
Inbound	Gate 12	8	R8-TG5	R8-TG5 TG5-Gate 12
Outbound	Gate 12	26		Gate 12 - TG5 TG5-R2426
Inbound	Gate 12	26	R24,26-TG5	R24,26-TG5 TG5-Gate 12
Outbound	Gate 3	8		Gate 3-TG5 TG5-R08
Inbound	Gate 3	8	R8-TG5	R8-TG5 TG5-Gate 3
Outbound	Gate 3	26		Gate 3-TG5 TG5-R2426
Inbound	Gate 3	26	R24,26-TG5	R24,26-TG5 TG5-Gate 3
Outbound	Gate 5	8		TG5-R08
Inbound	Gate 5	8	R8-TG5	R8-TG5
Outbound	Gate 5	26		TG5-R2426
Inbound	Gate 5	26	R24,26-TG5	R24,26-TG5
Outbound	Gate 7	8		Gate 7 - TG5 TG5-R08
Inbound	Gate 7	8	R8-TG5	R8-TG5 TG5-Gate7
Outbound	Gate 7	26		Gate 7 - TG5 TG5-R2426

Direction:	Gate:	Runway:	Runway Exit:	Taxiways:
Inbound	Gate 7	26	R24,26-TG5	R24,26-TG5 TG5-Gate7

Configurations

Baseline, City Centre

Configuration Name: Configuration
Time Used:
100 %

	From	To
Wind Direction:	no bound (°)	no bound (°)
Wind Speed:	no bound (knots)	no bound (knots)
Hour of Day:	no bound (hh:mm)	no bound (hh:mm)
Ceiling:	no bound (feet)	no bound (feet)
Visibility:	no bound (statute miles)	no bound (statute miles)
Temperature:	no bound (°F)	no bound (°F)

Point:	Arrivals Per Hour	Departures per Hour
1	100	200
2	200	100

Aicraft Size:	Runway	Arrivals (%)	Departures (%)	Touch & Gos (%)
Small	26	64 %	64 %	64 %
Small	8	36 %	36 %	36 %
Large	26	64 %	64 %	64 %
Large	8	36 %	36 %	36 %
Heavy	26	64 %	64 %	64 %
Heavy	8	36 %	36 %	36 %

Buildings

Baseline, City Centre

None.

Discrete Cartesian Receptors

Baseline, City Centre

Discrete Catersian Receptor Name: Cartesian_Receptor

X:	-251.40 meters
Y:	224.50 meters
Height:	1.80 meters
Elevation:	76.50 meters

Discrete Catersian Receptor Name: Cartesian_Receptor_(2)

X:	-241.50 meters
Y:	221.90 meters
Height:	1.80 meters
Elevation:	76.50 meters

Discrete Catersian Receptor Name: Cartesian_Receptor_(3)

X:	-232.00 meters
Y:	219.60 meters
Height:	1.80 meters
Elevation:	76.50 meters

Discrete Catersian Receptor Name: Cartesian_Receptor_(4)

X:	-222.10 meters
Y:	217.40 meters
Height:	1.80 meters
Elevation:	76.50 meters

Discrete Catersian Receptor Name: Cartesian_Receptor_(5)

X:	-213.60 meters
Y:	135.00 meters
Height:	1.80 meters
Elevation:	76.50 meters

Discrete Catersian Receptor Name: Cartesian_Receptor_(6)

X:	-222.10 meters

Y:	217.40 meters
Height:	1.80 meters
Elevation:	76.50 meters

Discrete Polar Receptors

Baseline, City Centre

None.

Cartesian Receptor Networks

Baseline, City Centre

None.

Polar Receptor Networks

Baseline, City Centre

None.

User-Created Aircraft

Baseline, City Centre

None.

User-Created GSE

Baseline, City Centre

None.

User-Created APU

Baseline, City Centre

None.

Emissions Inventory Summary

(Metric Tons per Year)

Baseline - City Centre 2016

Category	CO2	CO	THC	NM...	VOC	TOG	NOx	SOx	PM-...	PM-...	Fuel Cons...
Aircraft	15,463.370	650.366	34.396	37.268	36.782	38.214	31.225	5.740	N/A	N/A	4,901.227
GSE	N/A	128.242	N/A	4.247	4.434	4.856	13.484	0.614	0.680	0.645	N/A
APUs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Parking Facilities	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roadways	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Stationary Sour...	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Training Fires	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grand Total	15,463.370	778.608	34.396	41.516	41.216	43.070	44.709	6.355	0.680	0.645	4,901.227