TTC McNicoll Bus Garage TPAP Environmental Noise Assessment Toronto, ON

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1.0 INTRODUCTION

Novus Environmental Inc. (Novus) was retained by URS Canada Inc. (URS) on behalf of the Toronto Transit Commission (TTC) to prepare an environmental noise assessment for the proposed McNicoll Bus Garage located in the City of Toronto, Ontario. The TTC McNicoll Bus Garage (Facility) is proposed to be located on McNicoll Avenue, east of Kennedy Road in the City of Toronto, Ontario.

The purpose of the assessment is to evaluate the overall noise emissions of the proposed Facility with respect to relevant noise guidelines. The guideline most applicable to this project is the Ontario Ministry of the Environment (MOE) publication NPC-300 (MOE 2013).

Background sound levels in the vicinity of the proposed Facility are dominated by local road traffic from the neighbouring McNicoll Avenue, Kennedy Road, Midland Avenue, as well as rail traffic from the GO Rail line to the east. In addition, the future Redlea Avenue extension is predicted to contribute to the ambient environment in the area. Ambient road traffic modelling has been included in this assessment per NPC-300. Rail traffic volumes are not currently high enough to contribute to ambient levels per NPC-300. Although rail volumes are anticipated to significantly increase, rail noise has conservatively not been included in the ambient noise modelling calculations.

A scaled context plan and zoning map showing the site with respect to the surrounding area and modelled noise sensitive receptors is provided in **Figures 1 and 2**. A site layout plan, showing the proposed Facility arrangement and source locations, is provided in **Figure 3**. A land use zoning designation plan is also provided in **Appendix A**.

Noise sensitive locations surrounding the proposed Facility are as follows:

- Japanese Gospel Church of Toronto to the east;
- Mon Sheong Long Term Care Facility to the southwest;
- Mon Sheong Court to the southwest;
- Residential properties to the east, northwest, and southwest;
- Mary Ward Catholic Secondary School to the west;
- Scarborough Chinese Baptist Church to the north; and
- Toronto Chinese United Church to the northwest.

Without the inclusion of noise mitigation, impacts in excess of NPC-300 requirements are predicted to occur at the Mon Sheong facilities to the southwest. Mitigation has been recommended in order to meet requirements at all noise sensitive locations.

2.0 PROPOSED FACILITY DESCRIPTION

The project includes the construction of a new bus storage and maintenance facility for the Toronto Transit Commission (TTC). The proposed facility is located on McNicoll Avenue, east of Kennedy Road in the City of Toronto, Ontario. The proposed Facility will be used to house buses when they are not in use, and for minor maintenance and repair on the buses. The proposed Facility will operate 24 hours a day, seven days per week.

The proposed Facility is to be located in an area zoned Employment EH 0.5 under the new City of Toronto by-law. The proposed Facility is surrounded on all sides by Employment lands (zoned EH 0.5 under new City of Toronto By-law 569-2013, and as the Milliken Employment District under former City of Scarborough General Zoning By-law 24892). Further from the proposed Facility, Residential zonings are located to the east and west, and Commercial Residential to the southwest. See **Figure 2** and **Appendix A**.

Detailed Facility configurations were obtained from drawings provided by URS. Drawings used in the assessment are included in **Appendix B**. A site plan showing the location of significant noise sources, including rooftop heating, air conditioning and ventilation (HVAC) units, generators, bus routes and others, can be found in **Figure 3**.

3.0 APPLICABLE GUIDELINES

3.1 MOE Guideline D-6

The D-series of guidelines were developed by the Ontario Ministry of the Environment and Climate Change (MOECC) in 1995 as a means to assess recommended separation distances and other control measures for land use planning proposals in an effort to prevent or minimize 'adverse effects' from the encroachment of incompatible land uses where a facility either exists or is proposed. The guideline specifically addresses issues of odour, dust, noise and litter.

Guideline D-6 *Compatibility Between Industrial Facilities and Sensitive Land Uses*, addresses industrial land uses similar to the proposed bus facility. From the Guideline's synopsis, Guideline D-6 is "intended to be applied in the land use planning process to prevent or minimize future land use problems due to the encroachment of sensitive land uses and industrial land uses on one another." As the proposed project does not require a land use planning assessment (neither an Official Plan Amendment nor a Zoning By-law Amendment is required), Guideline D-6 does not strictly apply; regardless, it still can be used to consider what would generally be considered acceptable.

Guideline D-6 defines an Area of Influence and a Recommended Minimum Setback distance for three classes of industrial operation: light, medium, and heavy industrial uses. These distances are determined by industry class and are shown in in the following table:

Table 1: Guideline D-6 Potential Influence Areas and Recommended Minimum Setback Distances for Industrial Land Uses

Industry Classification	Area of Influence	Recommended Setback Distance
Class I – Light Industrial	70 m	20 m
Class II – Medium Industrial	300 m	70 m
Class III – Heavy Industrial	1000 m	300 m

Based on the size of the facility and the nature of the use, the proposed McNicoll bus facility is consistent with a Class 2 industry, with an Area of Influence of 300 m, and a Recommended Minimum Setback Distance of 70 m. Setback distances are shown in **Figure 4**.

Guideline D-6 recommends that detailed assessments be conducted where sensitive land uses are located within the Area of Influence of the industrial facility. There are several sensitive receptors within the Area of Influence. See **Figure 4**. The closest sensitive use is the Mon Sheong residential development/ long term care facility. The detailed analyses presented in the subsequent sections of the report meet this requirement of Guideline D-6.

Guideline D-6 also provides a Recommended Minimum Setback Distance of 70 m for Class 2 facilities. The distances between the Mon Sheong facility and the McNicoll facility are:

- Property line to property line – 23 m
- Mon Sheong Building to closest on-site bus route – 30 m

While the Mon Sheong facility lies within the Recommended Minimum Setback Distance from the proposed McNicoll bus facility, Guideline D-6 is clear that the Minimum Setback Distance is a *recommendation* only. Section 4.10 of the Guideline allows for development to occur within the minimum setback for "redevelopment, infilling and mixed use" areas. This project would qualify as redevelopment or infilling. In such cases, Section 4.10 of the Guideline requires that a detailed assessment be conducted to show that the relevant noise guidelines are met (in this case, MOE Publication NPC-300, the successor guideline to former MOE Publication LU-131). The detailed analyses presented in the subsequent sections of the report show that this is the case. Thus, the minimum setback requirements of Guideline D-6 have been addressed.

3.2 MOE Publication NPC-300

Due to significant road traffic noise from surrounding roadways, the area is considered to be a Class 1 area under MOE Publication NPC-300. A Class 1 Area is defined as "an area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the activities of people, usually road traffic, often referred to as 'urban hum'."

The Exclusion Limit Values for one-hour equivalent sound level (L_{eq}, dBA) for points of reception in a Class 1 area are summarized in the following table. There are no impulsive noise sources anticipated from the proposed Facility.

Table 2: NPC-300 Exclusion Sound Level Limit Values

Time Period	Exclusionary Sound Level Limits, 1h-L_{eq} (dBA) [1]
0700-1900h	50
1900-2300h	50
2300-0700h	45

Sound level limits do not apply to emergency equipment operating during emergency situations. However, emergency equipment operating in non-emergency situations, such as testing or maintenance of such equipment, requires assessment under NPC-300. The sound level limits for emergency equipment operating in non-emergency situations are 5 dB greater than the sound level limits otherwise applicable to stationary sources, as described above. Additionally, emergency equipment operating in non-emergency situations is to be assessed independently of all other stationary sources of noise.

4.0 POINTS OF RECEPTION

Noise sensitive areas are located in all locations from the proposed Facility. Noise sensitive areas and the representative locations are shown in **Figure 1**. **Figure 4** provides the Guideline D-6 setback distances from the proposed Facility. The following table summarizes the representative noise-sensitive areas considered in this assessment.

Table 3: Representative Point of Reception Locations

Receptor No.	Receptor Location	Description
R1	Mon Sheong Long Term Care Facility	4 storey institutional facility to the southwest
R2	Mon Sheong Court	11 storey institutional facility to the southwest
R3	1883 McNicoll Ave Apartments	Mixed Use Residential Apartment Building
R4	Mary Ward Catholic Secondary School	School to west (daytime receptor only)
R5	Residential (63 Shepton Way)	Representative of Low-Rise Residential to West
R6	Toronto Chinese United Church	Church to the northwest (daytime receptor only)
R7	Scarborough Chinese Baptist	Church to the north (daytime receptor only)
R8	Residential (106 Bellrock Dr.)	Representative of Low-Rise Residential to East
R9	Japanese Gospel Church of Toronto	Church to southeast (daytime receptor only)
V1	Vacant Lot, 2150 McNicoll	Vacant lot surrogate receptor on industrially zoned (M,MG,MS) vacant lot (daytime receptor only)

4.1 Vacant Lot Surrogate Receptors

There are two vacant lots near the project, as shown on **Figure 1**.

The vacant lot to the south of the proposed Facility located south of McNicoll Ave and west of the CNR/GO railway line falls under City of Toronto Zoning By-law 569-2013. The property is zoned EH – Employment Heavy Industrial Zone (EH 0.5). There are no sensitive uses permitted under the EH 0.5 zoning.

The vacant lot to the west of the proposed facility, located at 2150 McNicoll, north of McNicoll Ave and east of the CNR/GO railway line, falls under the former City of Scarborough General Zoning By-law 24892. This property is zoned as Industrial, General Industrial, and Special Industrial (M, MG, MS-414-913-991-1054). Under the M, MG and MS zonings, the following potentially sensitive land uses are permitted:

- Day nurseries
- Places of worship
- Educational and training facilities.

As a result, in accordance with NPC-300 requirements, a vacant lot surrogate receptor (V1) has been considered. As no building permit has been filed for the site, in accordance with NPC-300 requirements the receptor has been located at the centre of a 1 Ha portion of the lot consistent with the building pattern of the area, at height of 4.5 m above grade.

5.0 NOISE MODELLING

5.1 Sound Level Measurements and Source Inputs

Detailed sound level measurements were completed at the existing TTC Mount Dennis Bus Garage on July 11, 2013. The measured sound levels, in addition to mechanical data, engineering calculations, historical data, and data form the DEFRA Construction Noise Database were used as inputs to a predictive acoustical model to quantify outdoor noise emission associated with the proposed Facility. Modelled noise source locations are provided in **Figure 4**. Facility drawings are included in **Appendix B**. Detailed modelling inputs and calculations are included in **Appendix C**.

Exhaust fan sound levels were based on mechanical specifications and engineering calculations. Packaged Heating Ventilation and Air-Conditioning units (HVAC) were modelled based on provided manufacturer data.

Since the standby generator make and model number were not available at the time of this analysis, sound levels for the generator were assumed based on the sound data for a stage 1 environmental enclosure for a similarly sized unit. Although the proposed design called for the standby generator in the southwest corner of the site, this location has been updated for air quality purposes. Both locations have been considered, and the recommended mitigation for the standby generator would be effective in both locations. However, for the sake of simplicity, only the updated standby generator location (the northeast corner of the site) has been considered in this report.

Noise emissions from Bay Doors were estimated based on sound level measurements of idling buses, pressure washers, and an impact wrench taken on July 11, 2013. Sound level measurements were inputted into a spreadsheet model of the indoor configuration of each of the respective bays. Accounting for sound emissions, indoor reflections, and acoustic absorptions, noise emitted through bay doors was calculated. Based on the approximate dimensions of the doors, directivity patterns were applied to the sound emissions.

Emissions from the bus route were based on sound level measurements of bus pass-bys with and without acceleration. Estimated sound level emissions used these composite bus noise emissions, estimated speeds, distances travelled, and worst-case predicted number of buses travelling the route.

Refuelling of the buses was modelled based on sound levels from the DEFRA Construction Noise Database. The modelled source level was noted in the DEFRA database as a “Fuel Tanker Pumping.”

5.2 Worst-Case Operations

Based on information from TTC personnel, preliminary noise modelling has assumed two (2) potential worst-case scenarios, described briefly below:

1) 3 a.m. – Storage Bay at capacity (approximately 220 buses), all HVAC at capacity, the Repair Bay at capacity, Wash Bays operational, all Bay Doors open, and minimal bus traffic (approximately 14 buses per hour)
2) 6 a.m. – 103 buses exiting the facility, HVAC and bays operating at reduced capacity (approximately 25% of HVAC and Exhaust Fans operational over the given worst-case hour)

Maximum capacity emissions for each of the Bays are based on the following assumptions:

- Storage Bay – Approximately 50 buses idling per bay (the Storage Bay is split into four bays oriented north / south, and one bay intersecting these bays and the Wash Bay, to the east, oriented north / south)
- Wash Bay – Two buses being washed at a time, on average, for the entire worst-case hour
- Repair Bay – Approximately 15 buses idling, as well as a pressure washer and impact wrench each operating in worst-case locations for a total of 10 minutes per hour

In addition to the above operations, a 10 minute idling policy will be in place, meaning that buses will idle for a maximum of 10 minutes per worst-case hour. Maximum capacity emissions for the bus route were estimated based on a speed of 20 km/hr. Standby generator testing will be limited to daytime only testing.

In addition to the two worst-case maximum capacity scenarios, an additional daytime, regular operations scenario was considered.

5.3 Ambient Noise Modelling and Resulting Guideline Limits

The ambient sound levels from the surrounding roadways were modelled at the proposed development. Noise impacts from the proposed Facility were assessed based on the increased ambient noise from the surrounding roadways. Conservatively, ambient noise from high traffic volume railways lines was ignored.

Road traffic data was obtained from URS. Copies of the traffic data and calculations used in the analysis can be found in **Appendix D**. The following table summarizes the road traffic volumes used in the analysis.

Table 4: Summary of Road Traffic Data

Roadway Link	Traffic Levels (AADT)	Minimum Hourly Volumes			Commercial Traffic Breakdown		Vehicle Speed (km/h)
		Day	3am	6am	% Medium Trucks	% Heavy Trucks	
Kennedy Rd	28890	4.30 %	0.38 %	1.95 %	2.3 %	2.0 %	60
Redlea Ave	16840	4.30 %	0.38 %	1.95 %	2.3 %	2.0 %	50
McNicoll Ave	22800	4.30 %	0.38 %	1.95 %	2.3 %	2.0 %	50
Midland Ave	16560	4.30 %	0.38 %	1.95 %	2.3 %	2.0 %	50

Notes: [1] from URS TTC McNicoll Bus Garage Traffic Impact Study (assuming AADT = Peak PM * 10)
[2] from Average of Toronto Traffic data on file at Novus

Road traffic sound levels at the proposed development were predicted using Cadna/A, a commercially available noise propagation modelling software. Roadways were modelled as line sources of sound, with sound emission rates calculated using the ORNAMENT algorithms, the road traffic noise model of the MOE (MOE 1989). These predictions are equivalent to those made using the MOE's ORNAMENT or STAMSON v5.04 road traffic noise models.

5.4 Noise Modelling Parameters

The calculations were performed using Cadna/A, a computerized implementation of the ISO 9613-2 noise modelling standard (ISO 1996). The model took into consideration the layout of the proposed Facility, the location of the sources, and the surrounding buildings.

5.4.1 Ground Absorption

As described in ISO 9613-2, ground absorption values which can affect sound propagation can range between 0 and 1. A default ground factor of G = 0.0 was used to represent surrounding pavement / asphalt, with localized ground absorption added, representing the grass/ parkland areas, modelled with a ground factor of G = 1.0.

5.4.2 Reflection

An order of reflection of 2 was used in the modelling. That is to say, up to two reflections off of building walls were considered in predicting noise at offsite locations. The proposed Facility buildings and the surrounding buildings were modelled as reflective, with a typical absorption parameter of $\alpha = 0.2$.

Specific barriers required for noise control at the facility were modelled as absorptive, with a typical absorption parameter of $\alpha = 0.84$.

5.4.3 Barrier Effects

In calculating barrier effects, the following options were selected, which provide conservative estimates of barrier effects:

- Barriers which do not break the line of sight between the source and receiver are ignored ("no negative path length distance" option selected).
- The effect of noise barriers on reducing reflections from hard, reflective ground was ignored ("no subtraction of negative ground attenuation" option selected)

5.4.4 Building Evaluations

The "building evaluation" methodology of Cadna was used to evaluate noise impact on large buildings such as the Mon Sheong facilities, the McNicoll Ave apartments, the Mary Ward School, and the Scarborough Chinese Baptist Church. This procedure automatically models a series of receptor points along the façade, and allows for a more accurate estimate of potential impacts.

As both the ambient sound level due to road traffic (and the corresponding guideline limit) and the noise from the proposed Facility will vary depending on the location on the building, it is possible to have areas with low ambient and high noise levels from the Facility. The building evaluation approach allows for a façade location specific guideline limit to be determined, and then to be compared with the façade location specific noise from the Facility. Thus, compliance of noise limits over the entire receptor building can be determined.

5.5 Impact Assessment - Unmitigated Noise Levels, Normal Operations

Figures 5, 6 and 7 are plan view figures showing the applicable guideline limits, predicted noise from the facility, and compliance with NPC-300 requirements.

Figures 8, 9 and 10 provide 3-dimensional views of the Mon Sheong Long Term Care facility, showing the "building evaluation" predictions for applicable guidelines, facility noise, and excesses over the guideline limits.

The results are summarized in the following table:

Table 5: Predicted Unmitigated Noise Levels – Normal Operations

Receptor No.	Receptor Location	Time Period	Predicted TTC Facility Sound Level [1]	Guideline Limit [1]	Excess Over Guideline [2]
R1	Mon Sheong Long Term Care Façade	Daytime (7 am – 11 pm)	34 - 57	57 - 66	0
		Night-time, 3 am	36 - 61	46 - 55	0 - 13
		Night-time, 6 am	35 - 57	53 - 62	0 - 1
	Mon Sheong Long Term Care Outdoor Amenity	Daytime (7 am – 11 pm)	53	61	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0
R2	Mon Sheong Court	Daytime (7 am – 11 pm)	28 - 53	57 - 66	0
		Night-time, 3 am	31 - 58	45 - 56	0 - 13
		Night-time, 6 am	28 - 53	47 - 63	0 - 3
R3	1883 McNicoll Ave Apartments	Daytime (7 am – 11 pm)	46	65	0
		Night-time, 3 am	49	55	0
		Night-time, 6 am	46	62	0
R4	Mary Ward Secondary School	Daytime (7 am – 11 pm)	45	57	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0
R5	Residential (63 Shepton)	Daytime (7 am – 11 pm)	41	58	0
		Night-time, 3 am	45	48	0
		Night-time, 6 am	42	55	0
R6	Toronto Chinese United Church	Daytime (7 am – 11 pm)	41	66	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0
R7	Scarborough Chinese Baptist	Daytime (7 am – 11 pm)	47	58	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0
R8	Residential (106 Bellrock)	Daytime (7 am – 11 pm)	44	63	0
		Night-time, 3 am	48	52	0
		Night-time, 6 am	46	60	0
R9	Japanese Gospel Church of Toronto	Daytime (7 am – 11 pm)	46	59	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0
V1	Vacant Lot, 2150 McNicoll	Daytime (7 am – 11 pm)	50	57	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0

Note:

-- All values are L_{eq} (1-hr) sound exposures measured in dBA unless otherwise noted.

[1] Values represent the range of predicted sound levels over the exposed façade

[2] Excesses shown are calculated by subtracting the location-specific guideline limit from the corresponding location-specific Facility sound level.

5.6 Impact Assessment - Unmitigated Noise Levels, Generator Testing

The standby generator was considered separately from the other sources, per the requirements outlined in NPC-300. The generator will be tested during daytime hours only, and includes a "Stage 1" noise enclosure which reduces noise to a maximum sound level of 79 dBA at 7 m.

Modelled noise impacts were evaluated at all surrounding noise sensitive areas in **Figure 11**.

The results are summarized in the following table:

Table 6: Predicted Unmitigated Noise Levels – Generator Testing

Receptor No.	Receptor Location	Time Period	Predicted TTC Facility Sound Level [1]	Guideline Limit [1]	Excess Over Guideline [2]
R1	Mon Sheong Long Term Care Façade	Daytime (7 am – 11 pm)	22 - 38	57 - 66	0
	Mon Sheong Long Term Care Outdoor Amenity	Daytime (7 am – 11 pm)	30	61	0
R2	Mon Sheong Court	Daytime (7 am – 11 pm)	19 - 41	57 - 66	0
R3	1883 McNicoll Ave Apartments	Daytime (7 am – 11 pm)	37	65	0
R4	Mary Ward Secondary School	Daytime (7 am – 11 pm)	37	57	0
R5	Residential (63 Shepton)	Daytime (7 am – 11 pm)	37	58	0
R6	Toronto Chinese United Church	Daytime (7 am – 11 pm)	43	66	0
R7	Scarborough Chinese Baptist	Daytime (7 am – 11 pm)	50	58	0
R8	Residential (106 Bellrock)	Daytime (7 am – 11 pm)	37	63	0
R9	Japanese Gospel Church of Toronto	Daytime (7 am – 11 pm)	43	59	0
V1	Vacant Lot, 2150 McNicoll	Daytime (7 am – 11 pm)	46	57	0

Note:

-- All values are L_{eq} (1-hr) sound exposures measured in dBA unless otherwise noted.

[1] Values represent the range of predicted sound levels over the exposed façade

[2] Excesses shown are calculated by subtracting the location-specific guideline limit from the corresponding location-specific Facility sound level.

5.7 Noise Control Measures and Mitigated Sound Levels

Based on the predicted noise impacts for the normal operations scenario, noise mitigation measures are required. Based on discussions with TTC personnel, the preferred mitigation plan consists of the following mitigation measures:

- HVAC
  - Rotate all HVAC such that the louvres face north and/or east
- Storage bay doors and bus exit route
  - A canopy over top of the Storage Bay doors
    - Must be free of gaps or cracks, and must be a minimum of 10 kg/m^2
  - A 5m high noise barrier along the western property line, between the Storage Bay doors and Mon Sheong to the west
    - Must be free of gaps or cracks, and must be a minimum of 20 kg/m^2
    - Location as indicated in **Figure 12**
- Standby generator
  - Testing to be conducted during daytime hours only
  - An acoustic enclosure (stage 1 or better)
- Transpired Solar Collector HVAC outdoor air inlets
  - Relocate to the east of the Facility, eliminate, or silence
- Bus entrance route
  - Divert to northern entrance
- Maintenance bay doors on western façade
  - Keep shut at night

Figure 12 indicates the locations and specifications of the required noise mitigation measures.

Mitigated noise impacts modelled ambient noise, and resulting compliance were evaluated at all surrounding noise sensitive areas, as shown in **Figures 13, 14, and 15** for the daytime, 3am, and 6am periods, respectively.

Mitigated noise impacts, mapped on the façades of Mon Sheong Long Term Care, are shown in detail in **Figures 16, 17, and 18** for the daytime, 3am, and 6am periods, respectively.

Results are summarized in **Table 7**. As shown the table and in the above-noted figures, with the inclusion of the recommended mitigation measures, noise impacts are predicted to meet NPC-300 sound level requirements at all noise sensitive receptors.

Table 7: Predicted Mitigated Noise Levels – Normal Operations

Receptor No.	Receptor Location	Time Period	Predicted TTC Facility Sound Level [1]	Guideline Limit [1]	Excess Over Guideline [2]
R1	Mon Sheong Long Term Care Façade	Daytime (7 am – 11 pm)	33 - 55	57 - 66	0
		Night-time, 3 am	29 - 49	46 - 55	0
		Night-time, 6 am	33 - 49	53 - 62	0
	Mon Sheong Long Term Care Outdoor Amenity	Daytime (7 am – 11 pm)	48	61	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0
R2	Mon Sheong Court	Daytime (7 am – 11 pm)	27 - 50	57 - 66	0
		Night-time, 3 am	22 - 45	45 - 56	0
		Night-time, 6 am	26 - 44	47 - 63	0
R3	1883 McNicoll Ave Apartments	Daytime (7 am – 11 pm)	41	65	0
		Night-time, 3 am	39	55	0
		Night-time, 6 am	39	62	0
R4	Mary Ward Secondary School	Daytime (7 am – 11 pm)	44	57	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0
R5	Residential (63 Shepton)	Daytime (7 am – 11 pm)	42	58	0
		Night-time, 3 am	43	48	0
		Night-time, 6 am	41	55	0
R6	Toronto Chinese United Church	Daytime (7 am – 11 pm)	43	66	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0
R7	Scarborough Chinese Baptist	Daytime (7 am – 11 pm)	50	58	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0
R8	Residential (106 Bellrock)	Daytime (7 am – 11 pm)	46	63	0
		Night-time, 3 am	51	52	0
		Night-time, 6 am	47	60	0
R9	Japanese Gospel Church of Toronto	Daytime (7 am – 11 pm)	47	59	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0
V1	Vacant Lot, 2150 McNicoll	Daytime (7 am – 11 pm)	-88	57	0
		Night-time, 3 am	n/a	n/a	0
		Night-time, 6 am	n/a	n/a	0

Note:

-- All values are L_{eq} (1-hr) sound exposures measured in dBA unless otherwise noted.

[1] Values represent the range of predicted sound levels over the exposed façade

[2] Excesses shown are calculated by subtracting the location-specific guideline limit from the corresponding location-specific Facility sound level.

5.7.1 2150 McNicoll Vacant Lot

The lot located at 2150 McNicoll Ave, to the east of the proposed TTC facility, is currently vacant. While it is zoned for M, MG, and MS heavy and special industrial uses, including chemical manufacturing and metal smelting, the allowed uses also include educational facilities, daycares and places of worship. There have been no uses announced for the lot, and there are no current building permits for construction of any use at this location.

The modelling results presented above, conducted in accordance with NPC-300 requirements, show noise levels at the modelled VLSR location to be in compliance with the guideline limits.

The future construction of any of the allowed noise-sensitive uses on the 2150 McNicoll lot would be subject to Site Plan Approval from the City, and would require a noise impact assessment to be conducted for the proposed use. TTC will work with any future developer of the property, though the City's Site Plan Approval process and through the MOE's Environmental Compliance Approval process to ensure that compliance with the noise guidelines is maintained should a future noise sensitive use be proposed and installed at the 2150 McNicoll site.

6.0 BUS TRAFFIC ON SURROUNDING ROADWAYS

As part of their initial peer review, Valcoustics Canada Ltd, noise consultant for the Mon Sheong residents association, has raised the issue of changes in noise levels on local roadways as a potential area of concern. However, there are no specific Provincial guidelines for assessing the changes in noise levels on local roadways due to the installation of an industrial-type facility such as the one proposed. Instead, the MOE's guidelines focus on noise within the property boundary of the facility, including bus movements there. Regardless, in order to provide a more fulsome assessment of impacts and to address community concerns, TTC has requested that an assessment of off-site bus traffic be conducted.

There are two guidelines which can be used to provide some guidance as to what would normally be considered acceptable, as discussed below.

6.1 MOE Draft Guideline for Noise and Vibration Assessment of Transit Projects

The MOE's 2010 draft *Guideline for Noise and Vibration Assessment of Transit Projects* provides guidance on the assessment of noise impacts from transit projects, including new or expanded bus routes on existing roadways.

- No transit project should result in an increase in noise at a Point of Reception exceeding 5 dBA, either during the day (L_{eq} (16h)) or night (L_{eq} (8hr)); that is to say, the "With-

Project" sound levels cannot exceed the "Background Sound Level" by more than 5 dBA.

- In areas with high existing background sound levels, a penalty is applied to create an "Adjusted Noise Impact" used in determining the With Project Sound Level.
- No pass-by of a bus should result in an L_{eq} (Passby) sound level in excess of 80 dBA.

An assessment of sound level values due to road traffic at a 15 m setback distance from the roadway centreline was completed for both Redlea Ave and McNicoll Ave, using the MOE's ORNAMENT road traffic noise model.

Based on the traffic projections for the future Redlea Avenue performed by URS, the future Redlea Avenue will have approximately an annual average daily traffic (AADT) volume of 16,800 vehicles. The AADT of McNicoll Avenue is 22,800. Assuming traffic distributions consistent with non-industrial areas within the City of Toronto, both roadways will have approximately 2.3% medium and 2.0% heavy vehicles as background traffic. City buses were assumed to count as medium trucks from a noise perspective.

Assessment results are shown in the following tables:

Table 8: Assessment of Impacts – Receptors Along Redlea Ave

Time Period	Background Noise Level (dBA at 15 m)	With Project Noise Level (dBA at 15 m)	Adjustment Factor [1] (dBA)	Adjusted Noise Level [2] (dBA at 15 m)	Adjusted Noise Impact [3]	Meets Criteria?
Daytime (7am to 11pm)	65.9	66.2	1.1	67.4	1.5	Yes
Night-time (11 pm to 7 am)	59.3	61.6	1.2	62.8	3.5	Yes

Notes:

[1] Daytime – greater of: 0.1 x [Daytime "With Project Nosie Level" L_{eq} (16hr) - 55]; or 0
Night-time – greater of: 0.1 x [Nighttime "With Project Nosie Level" L_{eq} (8hr) - 50]; or 0

[2] With Project Noise Level + Adjustment Factor

[3] Adjusted Noise Level – Background Noise Level

Table 9: Assessment of Impacts – Receptors Along McNicoll Ave

Time Period	Background Noise Level (dBA at 15 m)	With Project Noise Level (dBA at 15 m)	Adjustment Factor [1] (dBA)	Adjusted Noise Level [2] (dBA at 15 m)	Adjusted Noise Impact [3]	Meets Criteria?
Daytime (7am to 11pm)	67.2	67.3	1.2	68.5	1.3	Yes
Night-time (11 pm to 7 am)	60.7	61.1	1.1	62.2	1.6	Yes

Notes:

[1] Daytime – greater of: 0.1 x [Daytime "With Project Nosie Level" L_{eq} (16hr) - 55]; or 0
Night-time – greater of: 0.1 x [Nighttime "With Project Nosie Level" L_{eq} (8hr) - 50]; or 0

[2] With Project Noise Level + Adjustment Factor

[3] Adjusted Noise Level – Background Noise Level

The additional bus traffic in both Redlea and McNicoll will not result in a change in daytime or nighttime sound levels greater than 5 dBA. In addition, as a typical "medium truck", the L_{eq} (Pass-by) limit of 80 dBA will also be met for all buses.

Therefore, under the MOE *Guideline for Noise and Vibration Assessment of Transit Projects,* adverse impacts would not be anticipated, and an assessment of noise mitigation measures would not be required.

6.2 MOE Draft Noise Guidelines for Landfill Sites

The MOE's draft *Noise Guidelines for Landfill Sites* (1998) do include assessment criteria for ranking preferred haul routes with respect to changes in noise levels. The Landfill Guideline requires a quantitative assessment of hourly sound levels on haul route links. Changes in sound levels can then be qualitatively ranked as follows:

Table 10: MOE Noise Guidelines for Landfill Sites – Haul Route Noise Change Ranking

Sound Level Increase (dBA)	Qualitative Rating
0 to 3 inclusive	Insignificant
> 3 to 5 inclusive	Noticeable
> 5 to 10 inclusive	Significant
> 10 and over	Very Significant

It should be noted that the Landfill Noise Guidelines do not prohibit the use of haul routes where significant impacts are predicted; instead they required that haul routes be selected which minimize the overall noise impact.

Change assessments for Redlea and McNicoll are shown in **Tables 11 and 12**.

Table 11: Change in Noise Assessment – Redlea Avenue

Hour Beginning	Background Traffic			Background Noise Level (dBA at 15m)	Project Bus Traffic	With Project Noise Level (dBA at 15 m	Change in Sound Level (Project – Background)
	Autos	Medium Trucks	Heavy Trucks				
0000	227	5	5	59.9	2	60.1	0.2
0100	136	3	3	57.7	5	58.5	0.8
0200	84	2	2	55.5	20	59.2	3.7
0300	61	1	1	54.2	10	57.0	2.8
0400	58	1	1	54.0	14	57.7	3.7
0500	102	2	2	56.4	67	63.1	**6.7**
0600	315	7	6	61.3	72	64.9	3.6
0700	694	16	14	64.7	12	65.1	0.4
0800	1047	25	22	66.5	1	66.5	0.0
0900	1003	24	21	66.3	25	66.9	0.6
1000	870	21	18	65.7	43	66.8	1.1
1100	879	21	18	65.7	1	65.8	0.0
1200	936	22	19	66.0	-	-	-
1300	972	23	20	66.2	-	-	-
1400	1000	24	21	66.3	25	66.9	0.6
1500	1069	25	22	66.6	24	67.1	0.5
1600	1168	28	24	67.0	3	67.0	0.1
1700	1238	29	25	67.2	-	-	-
1800	1141	27	23	66.9	3	66.9	0.1
1900	945	22	19	66.1	37	66.9	0.9
2000	728	17	15	64.9	23	65.6	0.7
2100	608	14	12	64.1	2	64.2	0.1
2200	496	12	10	63.3	13	63.9	0.6
2300	349	8	7	61.7	12	62.5	0.8
TOTAL	32255	763	662	--	840	--	--

Table 12: Change in Noise Assessment – McNicoll Avenue

Hour Beginning	Background Traffic			Background Noise Level (dBA at 15m)	Project Bus Traffic	With Project Noise Level (dBA at 15 m	Change in Sound Level (Project – Background)
	Autos	Medium Trucks	Heavy Trucks				
0000	307	7	6	61.2	-	-	-
0100	185	4	4	59.0	1	59.1	0.1
0200	114	3	2	56.9	4	57.6	0.8
0300	83	2	2	55.5	2	56.0	0.5
0400	79	2	2	55.3	3	56.1	0.8
0500	138	3	3	57.7	14	59.7	1.9
0600	427	10	9	62.6	15	63.4	0.8
0700	940	22	19	66.0	3	66.1	0.1
0800	1418	34	29	67.8	-	-	-
0900	1358	32	28	67.6	5	67.7	0.1
1000	1178	28	24	67.0	9	67.2	0.2
1100	1190	28	24	67.1	-	-	-
1200	1267	30	26	67.3	-	-	-
1300	1316	31	27	67.5	-	-	-
1400	1354	32	28	67.6	5	67.7	0.1
1500	1447	34	30	67.9	5	68.0	0.1
1600	1582	37	32	68.3	1	68.3	0.0
1700	1677	40	34	68.5	-	-	-
1800	1545	37	32	68.2	1	68.2	0.0
1900	1280	30	26	67.4	8	67.5	0.1
2000	985	23	20	66.2	5	66.4	0.1
2100	824	19	17	65.5	-	-	-
2200	671	16	14	64.6	3	64.7	0.1
2300	472	11	10	63.0	3	63.2	0.2
TOTAL	43671	1033	897	--	177	--	--

For the majority of the time, the noise change produce by bus traffic will be less than 3 dB and insignificant. The landfill noise guidelines would not warrant a change in haul route selection.

6.3 Bus Road Traffic Conclusions

There are no applicable guidelines for assessing the increases in road traffic noise due to traffic from an industrial-type facility. In the absence of specific requirements, this assessment has considered both the MOE *Guideline for Noise and Vibration Assessment of Transit Projects* and the *Noise Guidelines for Landfill Sites*. Under both guidelines, changes in sound levels due to the increase in bus traffic are unlikely to create an adverse effect. Neither guideline would require investigation of noise mitigation measures or changed to the selected route.

Therefore, it is concluded that the additional bus traffic on local roadways will not result in impacts at off-site receptors.

7.0 CONCLUSIONS

Novus was retained by URS to prepare an environmental noise assessment for the McNicoll Bus Garage planned to be located along McNicoll Avenue, east of Kennedy Road in the City of Toronto, Ontario.

Unmitigated noise impacts were predicted to exceed NPC-300 requirements. A noise mitigation plan has been developed. With the inclusion of the recommended mitigation, the proposed Facility is expected to meet both MOE Guideline D-6 and MOE Publication NPC-300 requirements at all surrounding noise sensitive receptors during all periods of the day and night.

Although not required by Provincial guidelines for this type of facility, an assessment of noise from bus traffic along local roadways has been conducted. Sound levels from bus activity along local roadways has been assessed and compared against criteria contained in the MOE *Guideline for Noise and Vibration Assessment of Transit Projects* and in the MOE *Noise Guidelines for Landfill Sites*. The assessment shows that under both guidelines, changes in sound levels due to the increase in bus traffic are unlikely to create an adverse effect. Neither guideline would require investigation of noise mitigation measures or changes to the selected routes. Therefore, the additional bus traffic on local roadways will not result in impacts at off-site receptors.

8.0 REFERENCES

ASHRAE, 2007, HVAC Applications, Chapter 47: Sound and Vibration Control

International Organization for Standardization, 1996, ISO 9613-2: Acoustics – Attenuation of Sound During Propagation Outdoors Part 2: General Method of Calculation, Geneva, Switzerland

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Ontario Ministry of the Environment 2010, Guideline for Noise and Vibration Assessment of Transit Projects (draft)

Ontario Ministry of the Environment, 2013, Publication NPC-300: Environmental Noise Guideline, Stationary and Transportation Sources – Approval and Planning

Figures

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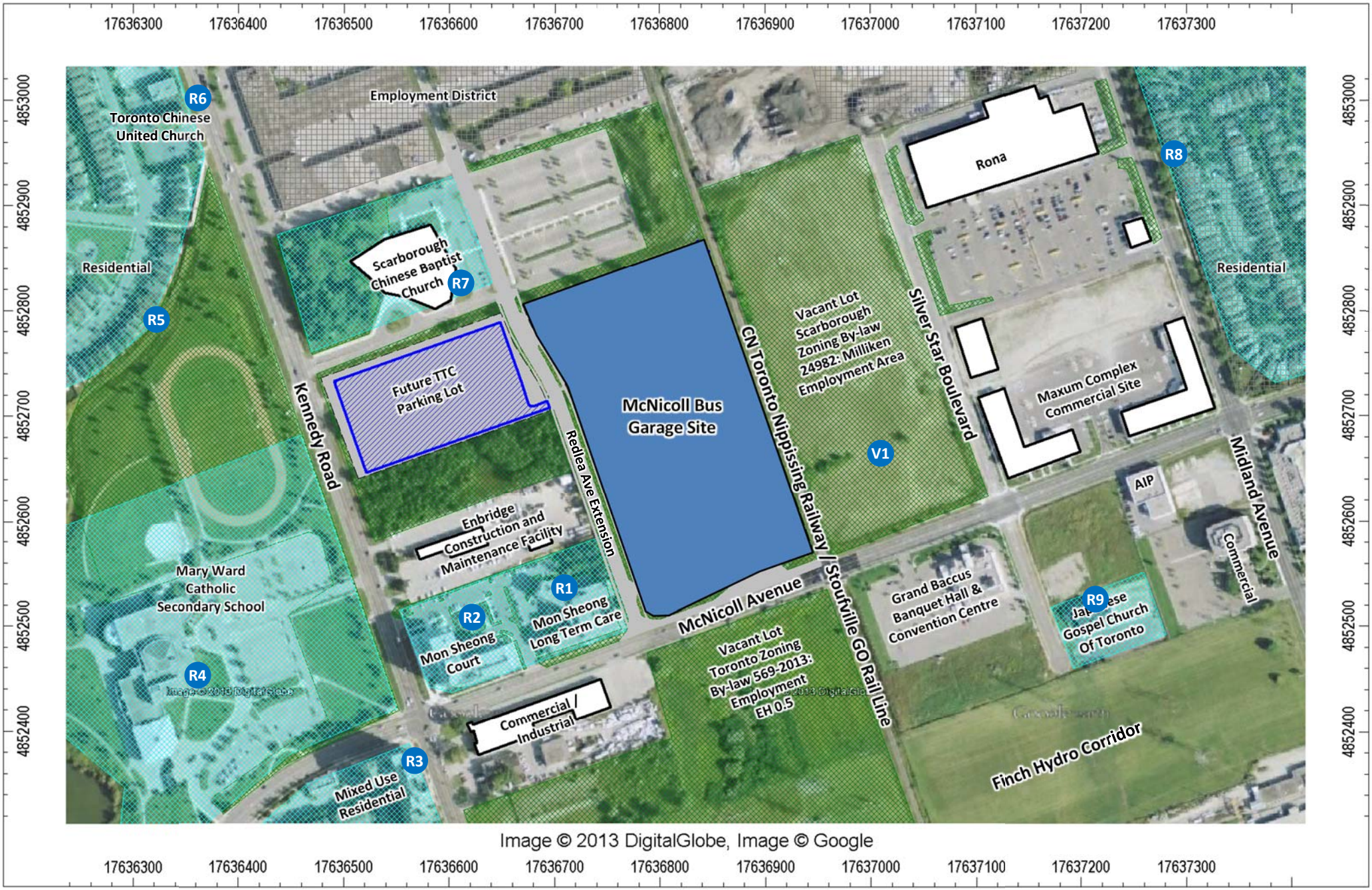

Figure No. **1**

Context Plan

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 5,000
Date: 14 / 11 / 21
File No.: 13-0054
Drawn By: KAC/ SLP

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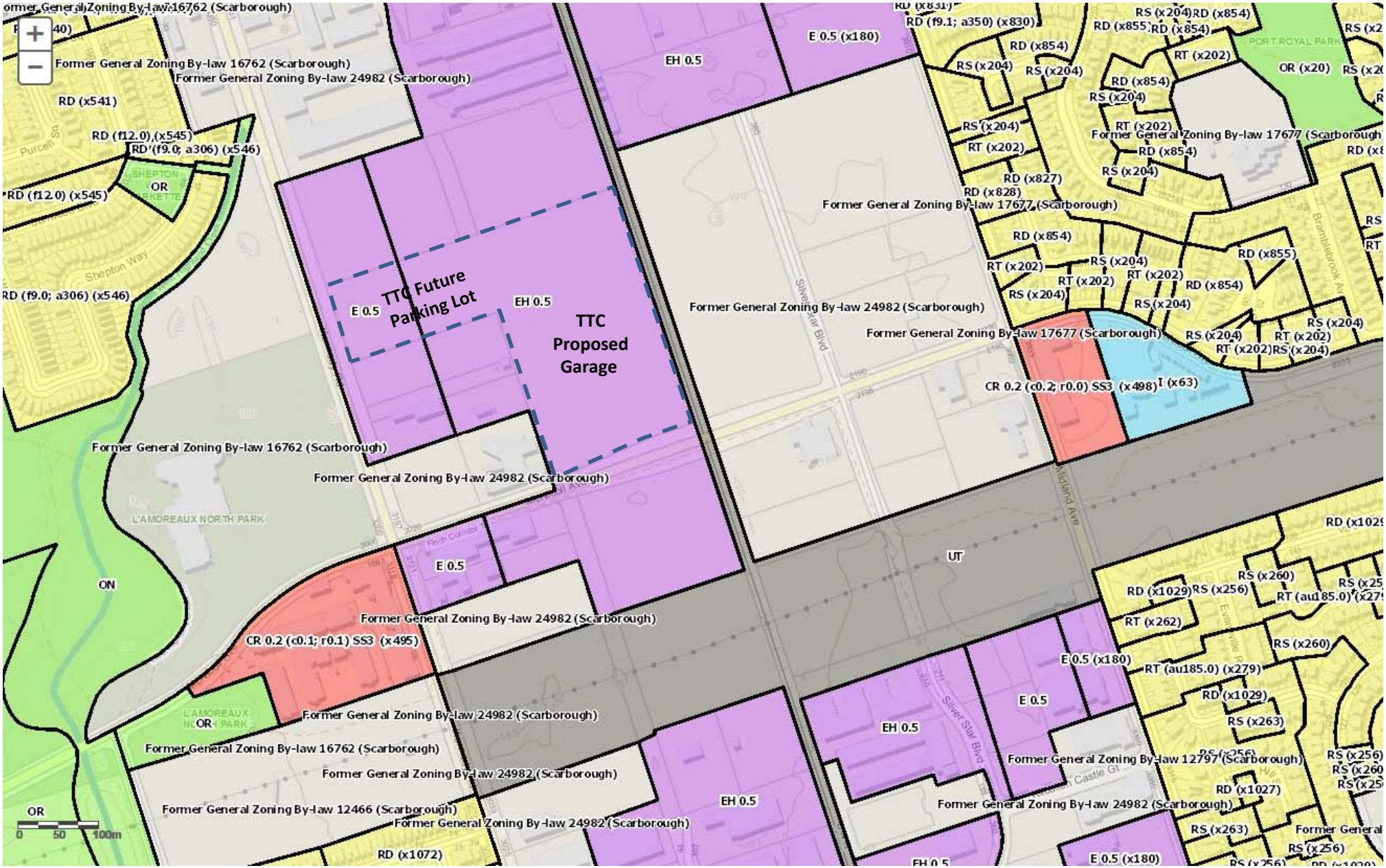

- Residential
- Residential Apartment
- Open Space
- Utility and Transportation
- Commercial
- Commercial Residential
- Commercial Residential Employment
- Employment Industrial
- Institutional

Figure No. **2**

Zoning Map

From map.toronto.ca/maps/map.jsp?app=ZBL_CONSULT

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: n/a
Date: 14 / 11 / 21
File No.: 13-0054
Drawn By: SLP

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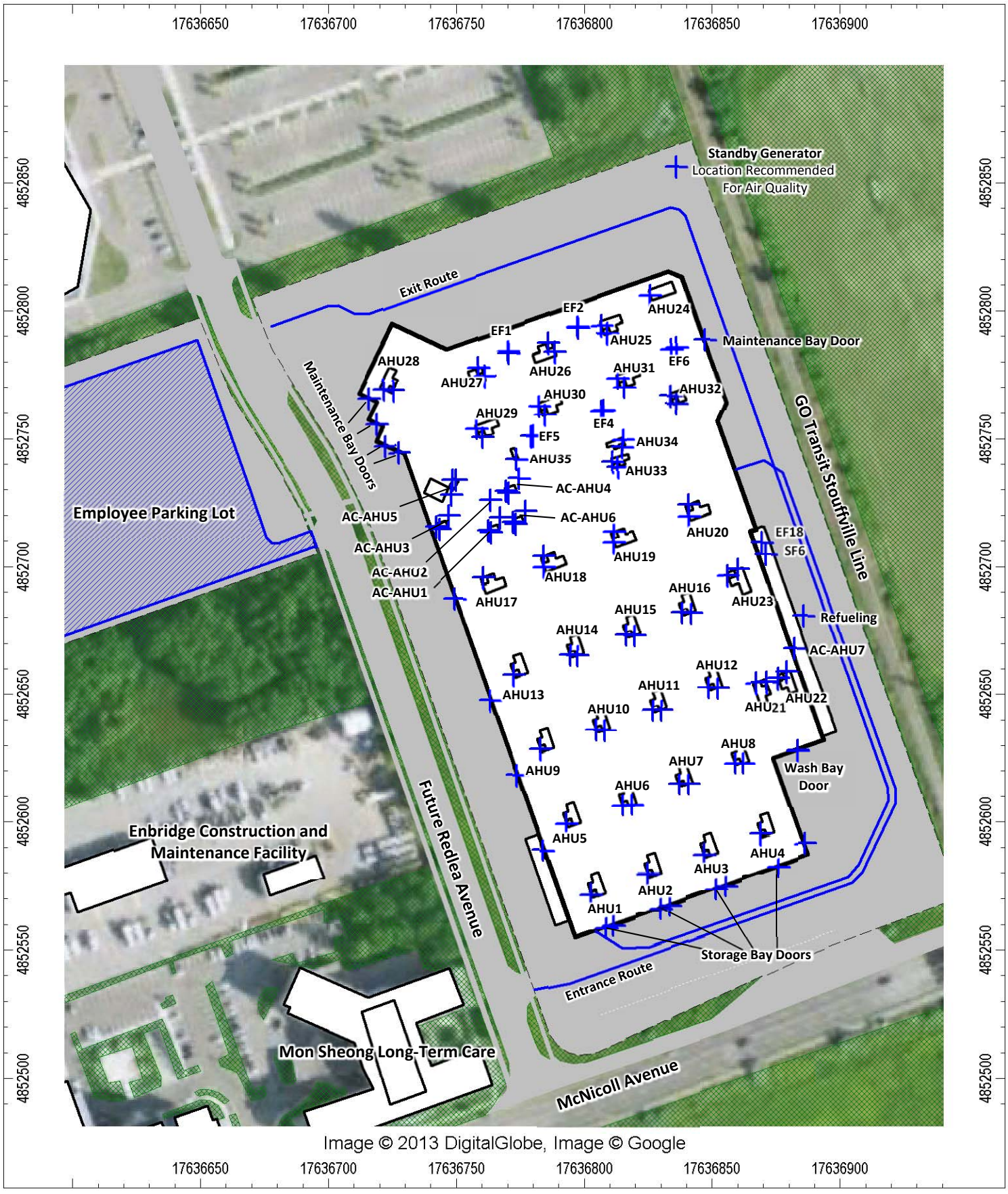

Figure No. **3**

Proposed Facility Layout

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 2,000
Date: 14 / 11 / 12
File No.: 13-0054
Drawn By: KAC

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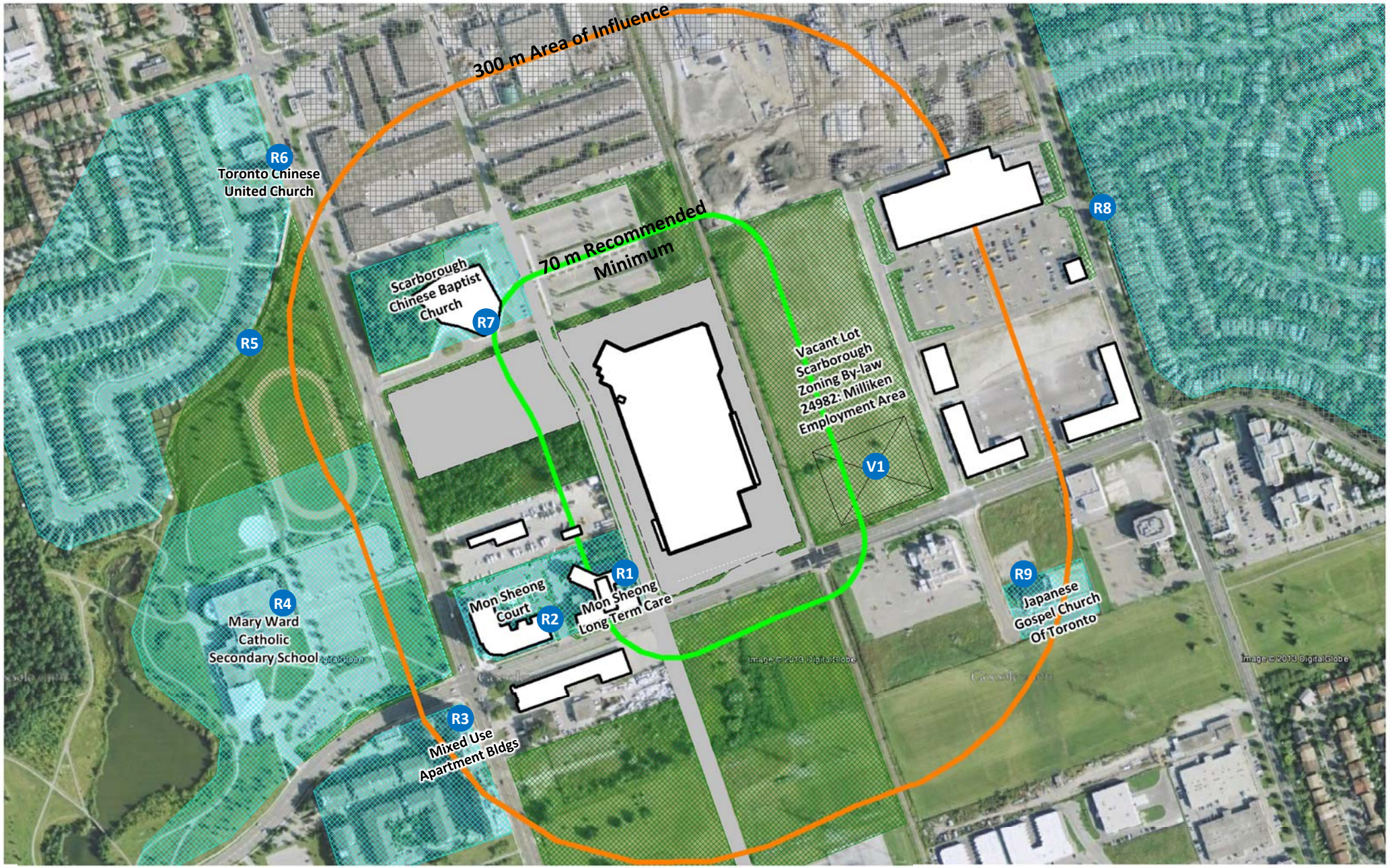

Image © 2013 DigitalGlobe, Image © Google

Figure No. **4**

Guideline D-6 Setbacks From Site

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 6,000
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: SLP

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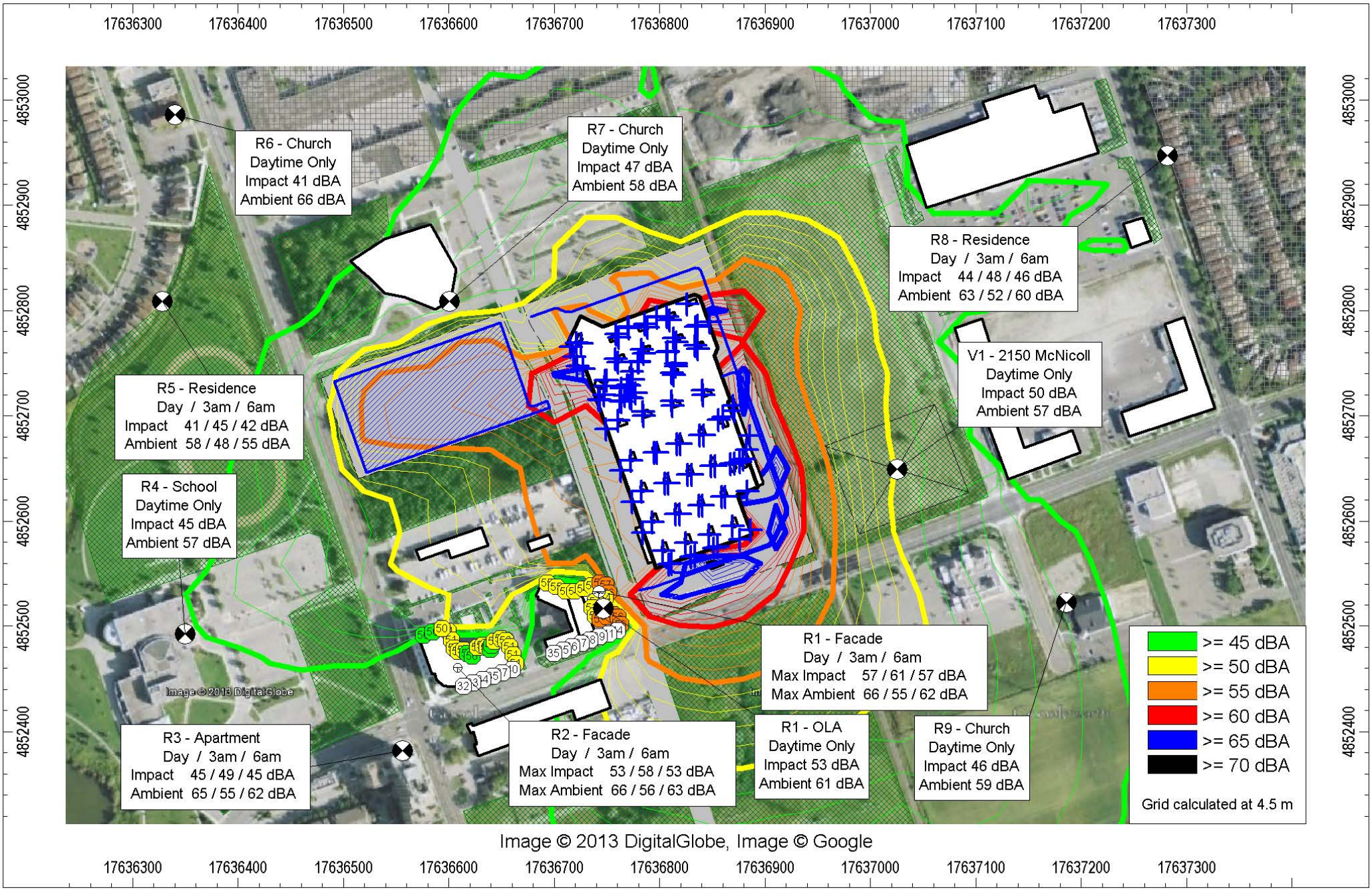

Figure No. **5**

Unmitigated Noise Impact Contours
Daytime Operations

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 5,000
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

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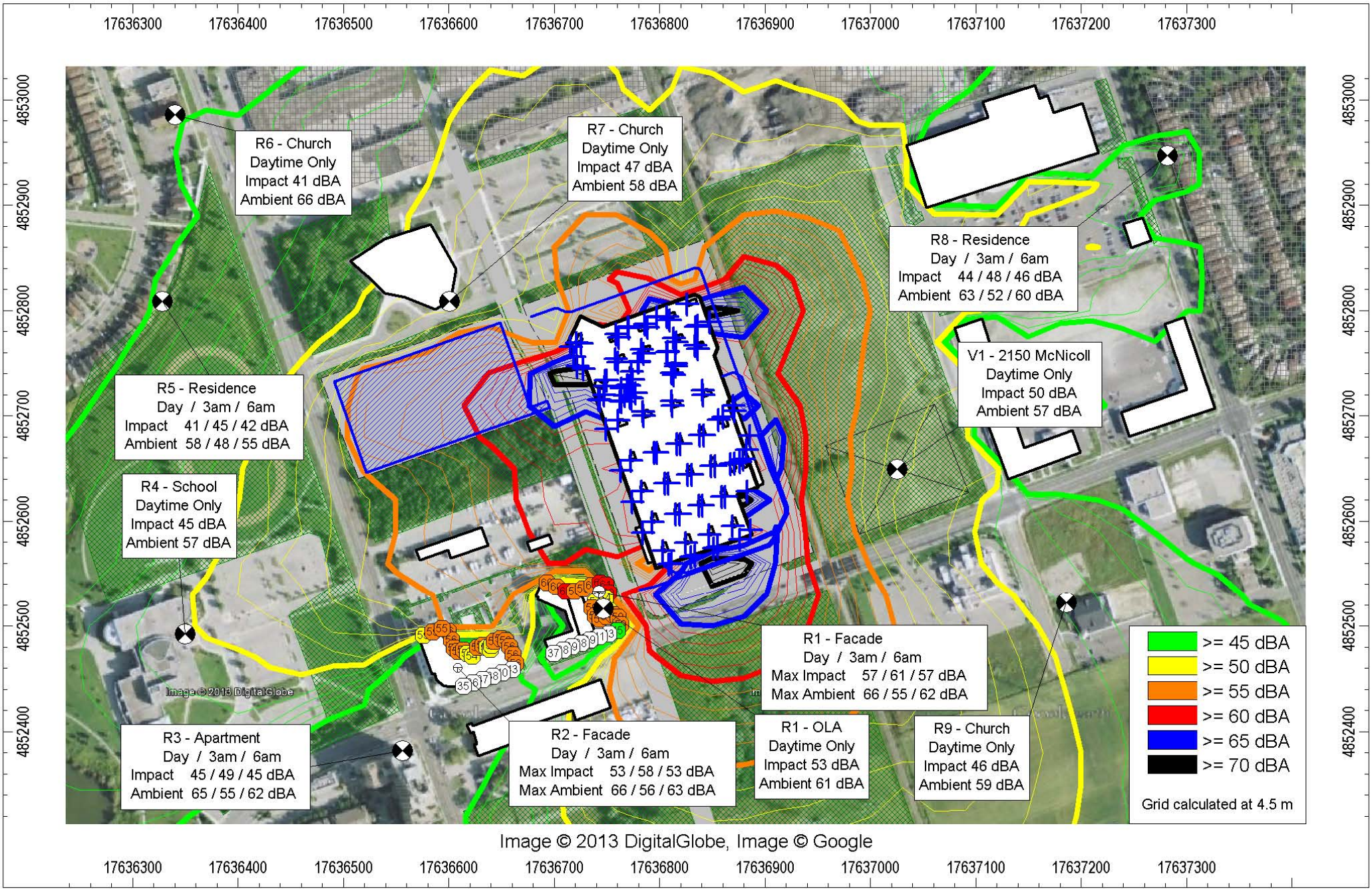


Figure No. **6**

Unmitigated Noise Impact Contours
Worst-case 3am Operations

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 5,000
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

novus ENVIRONMENTAL

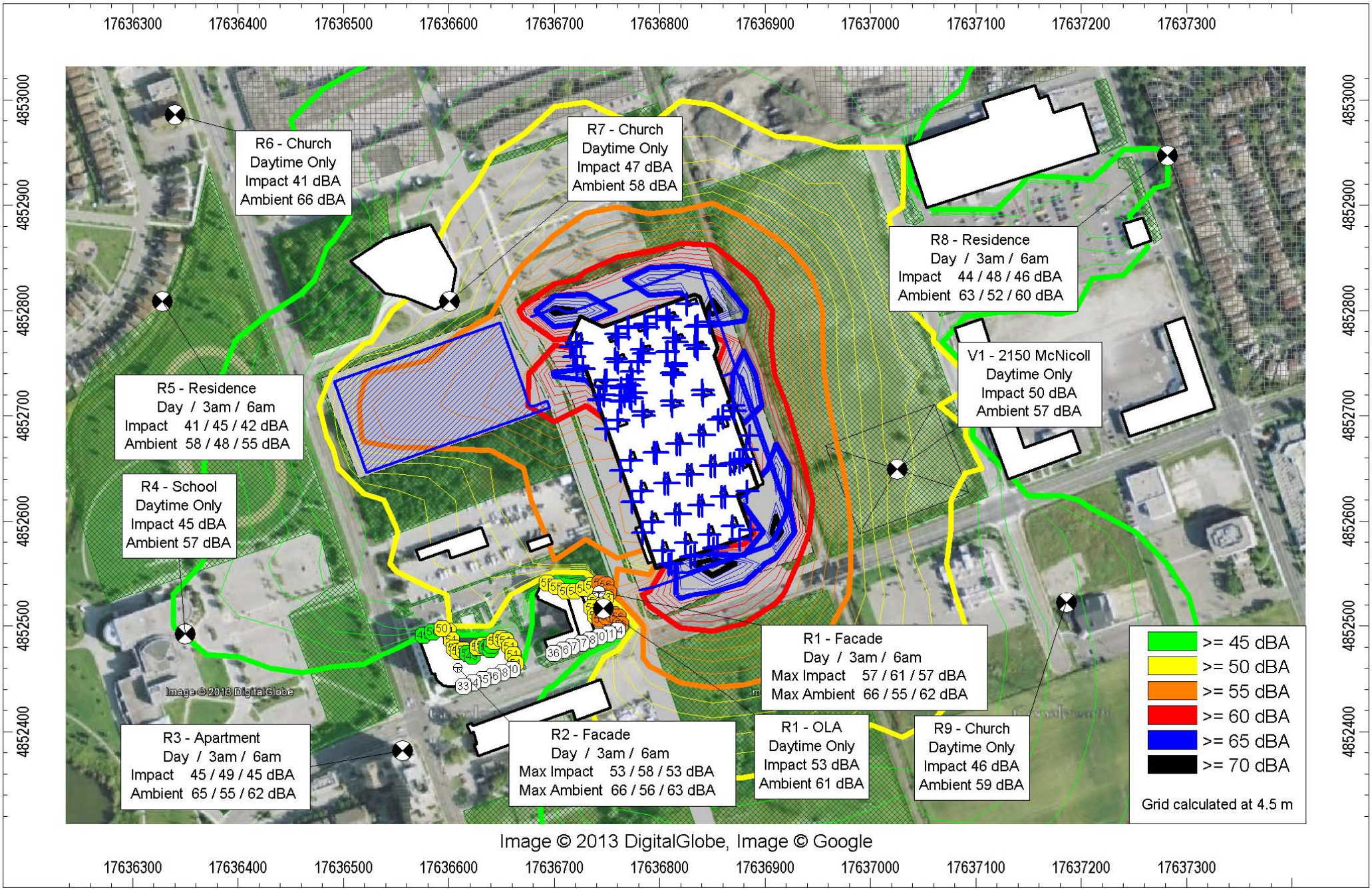


Figure No. **7**

Unmitigated Noise Impact Contours
Worst-case 6am Operations

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 5,000
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

novus ENVIRONMENTAL

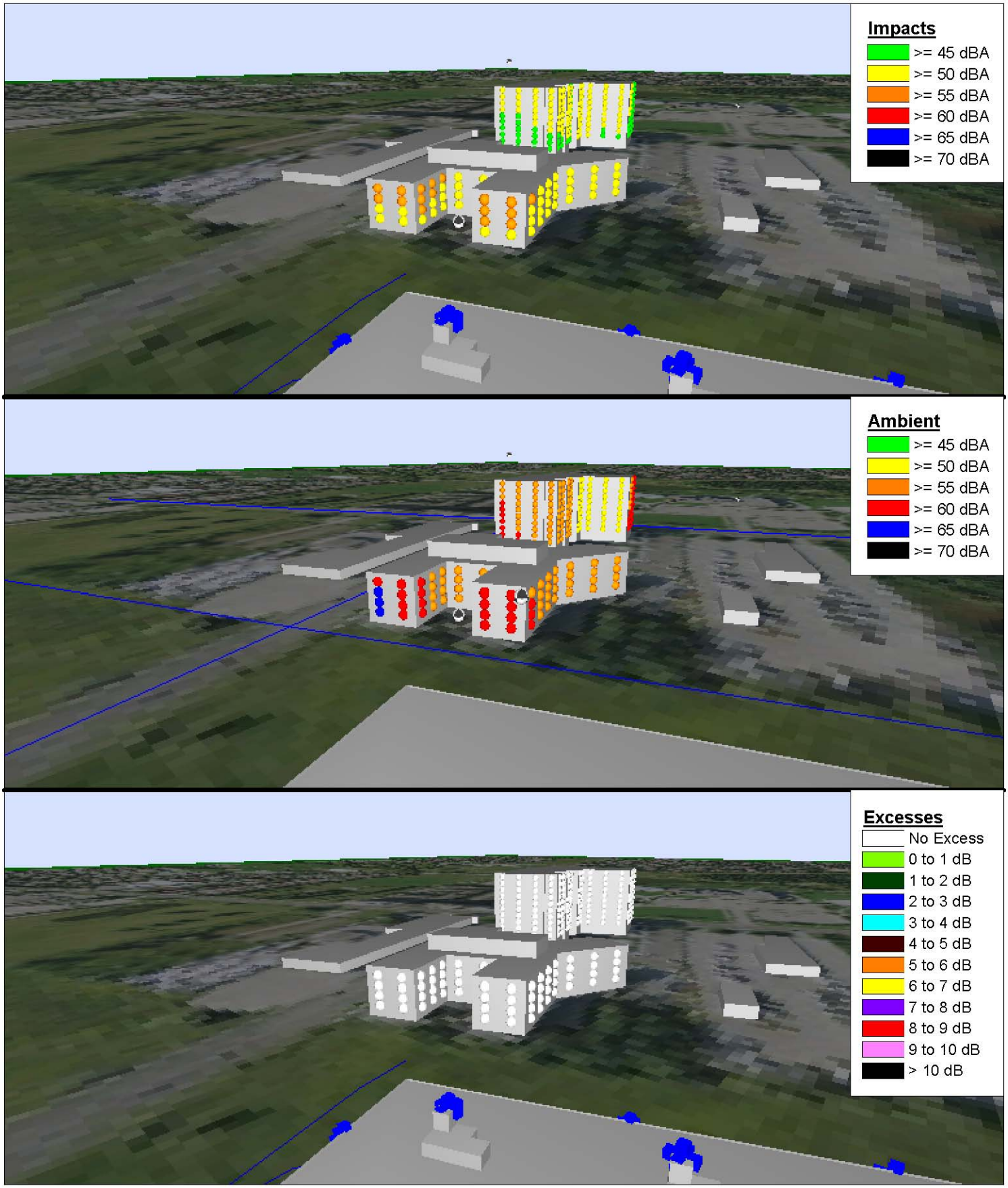


Figure No. **8**

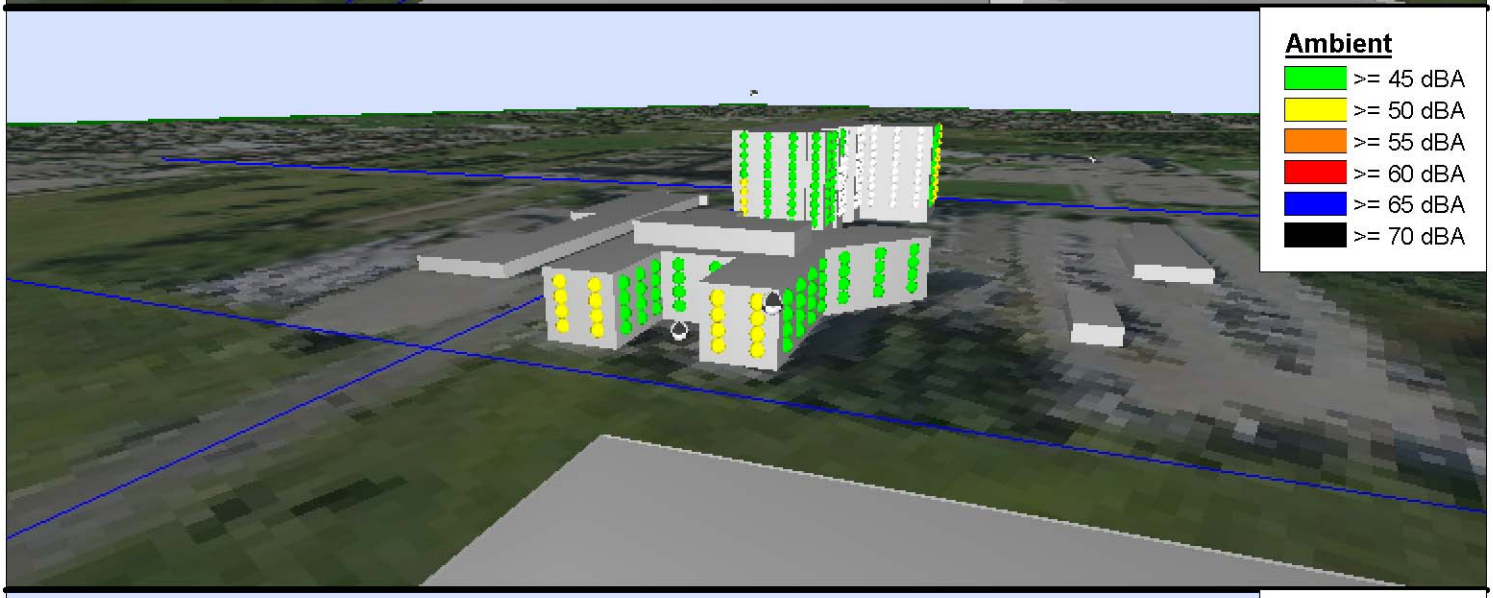
Preferred Design – Daytime Operations
Façade Noise Impacts – Mon Sheong LTC

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: n/a
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

novus ENVIRONMENTAL



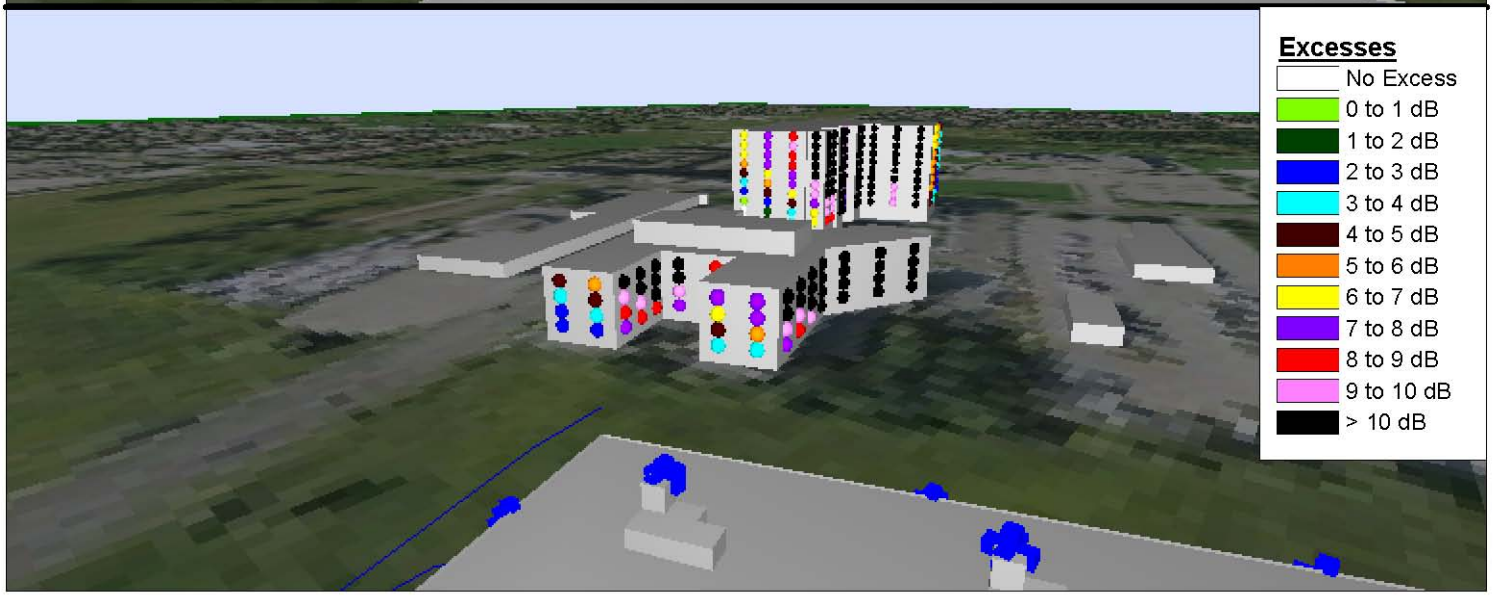


Figure No. **9**

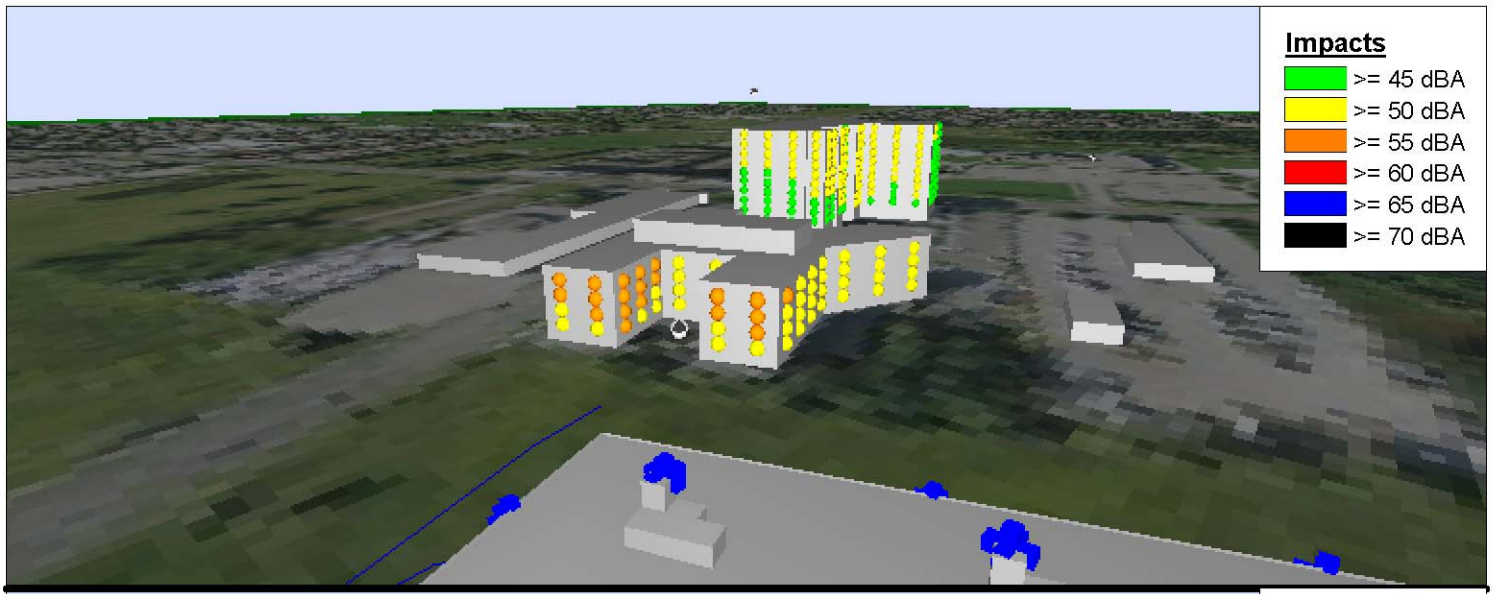
Preferred Design – Worst-case 3am Operations
Façade Noise Impacts – Mon Sheong LTC

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: n/a
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

novus ENVIRONMENTAL



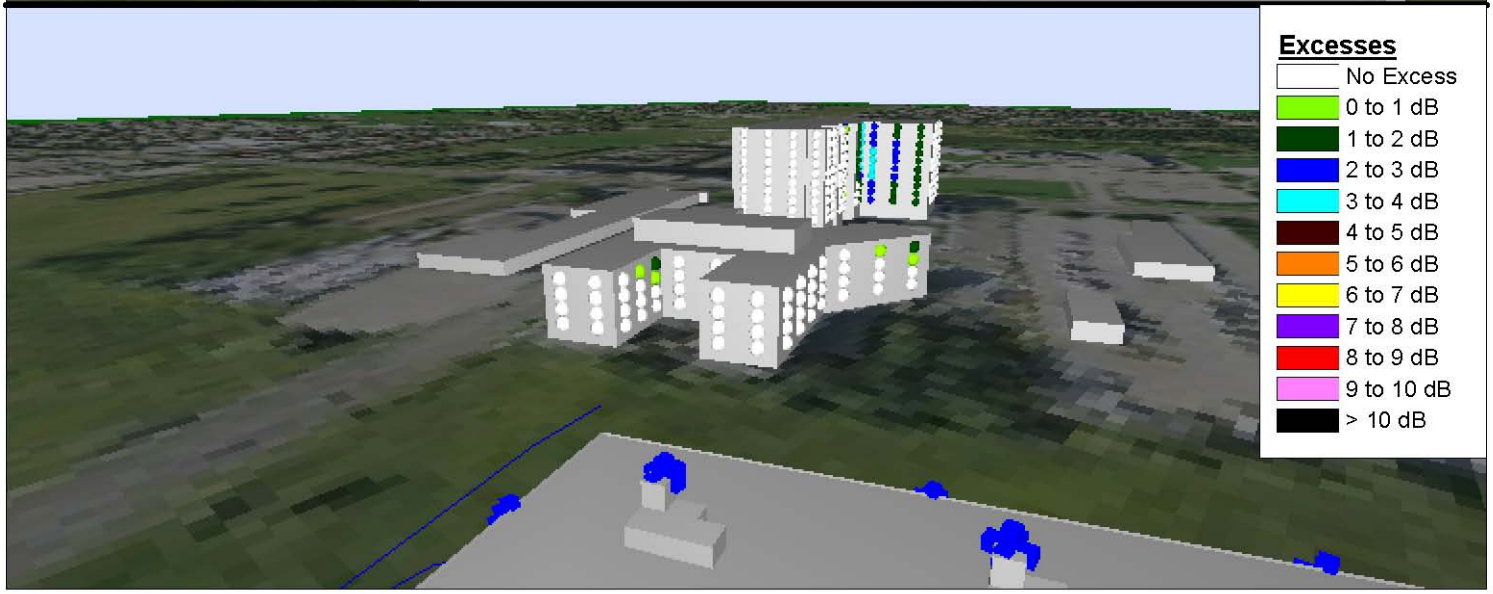


Figure No. **10**

Preferred Design – Worst-case 6am Operations
Façade Noise Impacts – Mon Sheong LTC

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: n/a
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

novus ENVIRONMENTAL

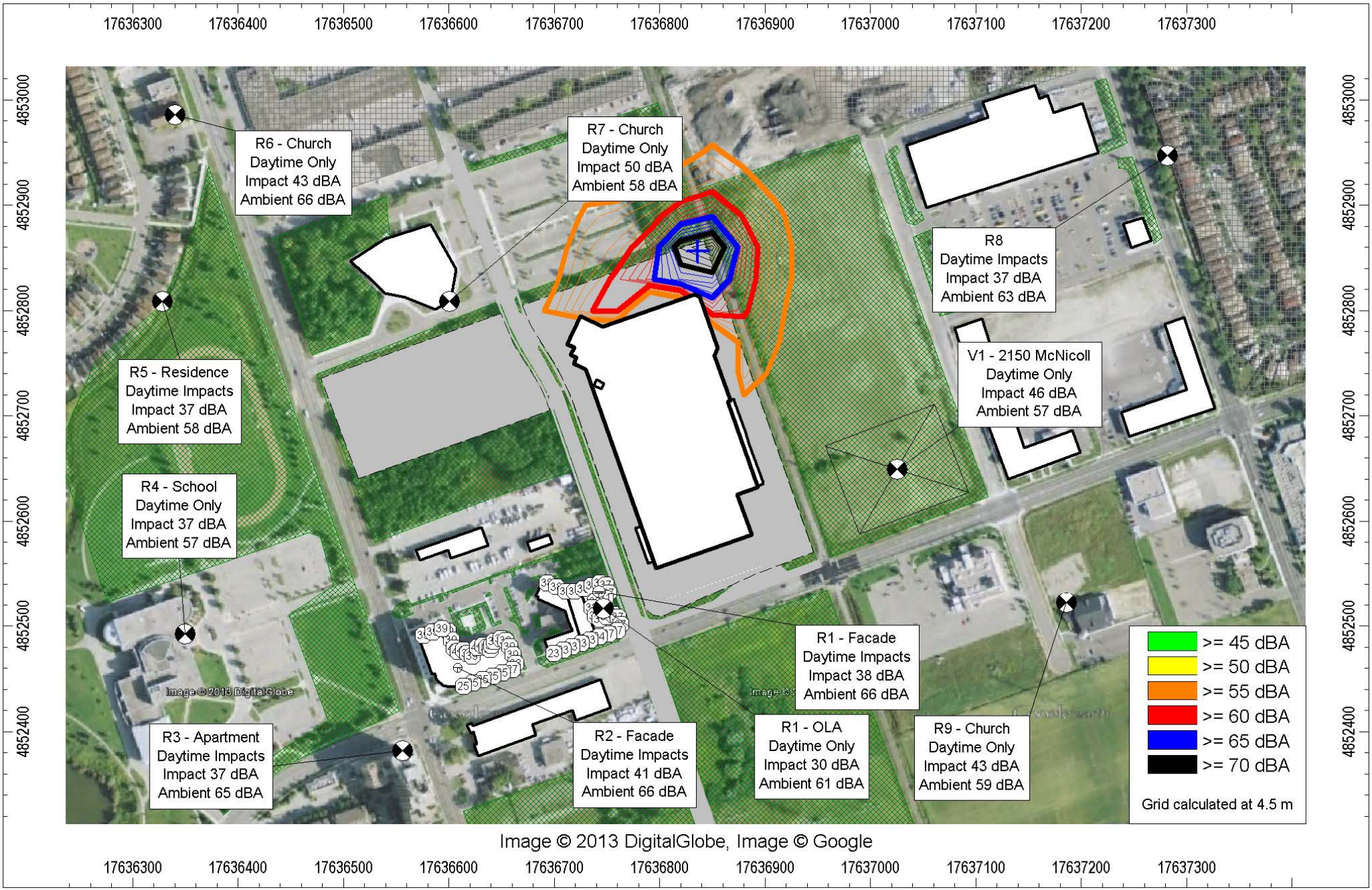


Figure No. **11**

Noise Impact Contours
Standby Generator Testing – Daytime Only

TTC McNicoll Bus Garage
Toronto, Ontario

True North

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Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

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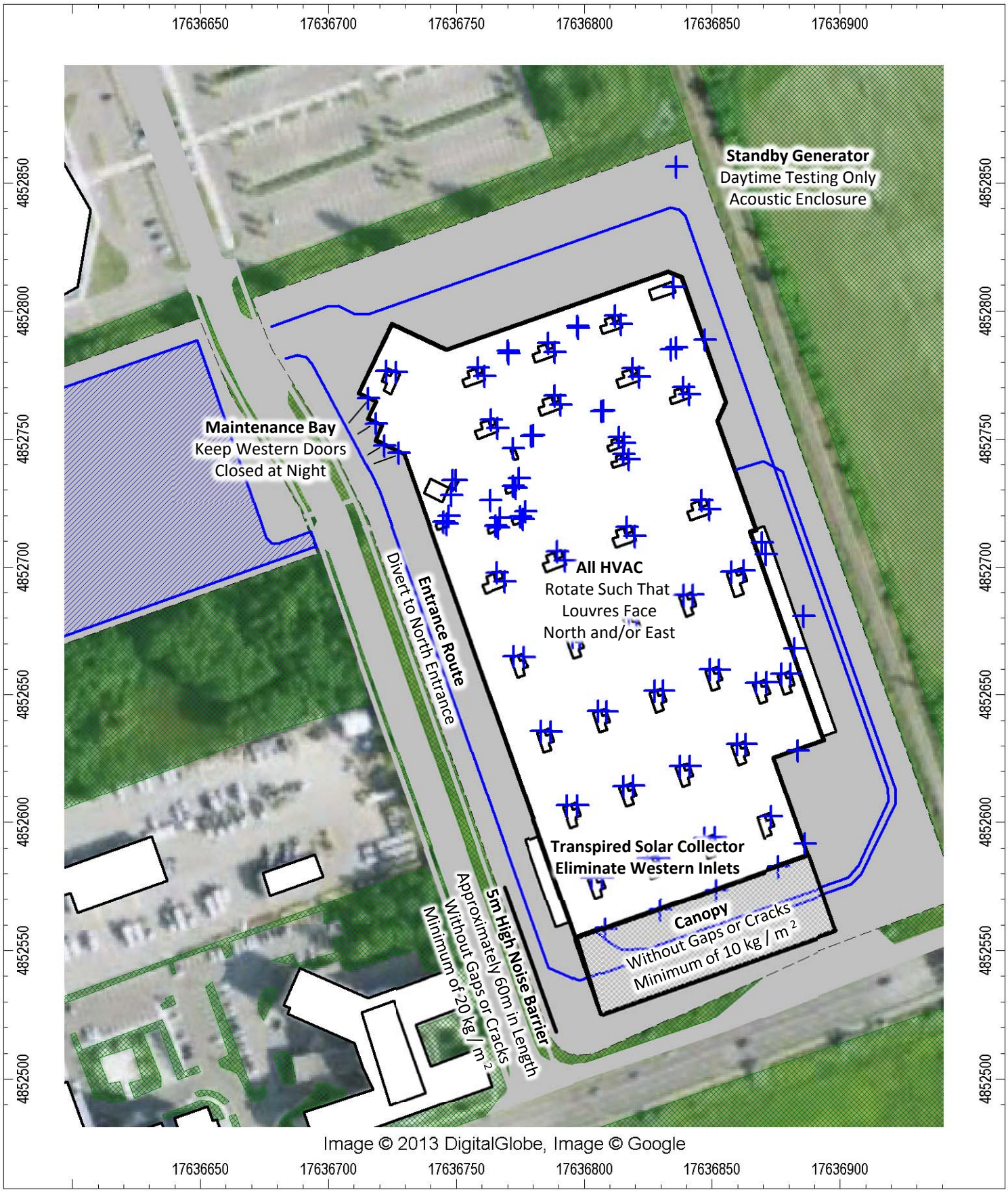

Figure No. **12**

Facility Layout
Showing Recommended Mitigation

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 2,000
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

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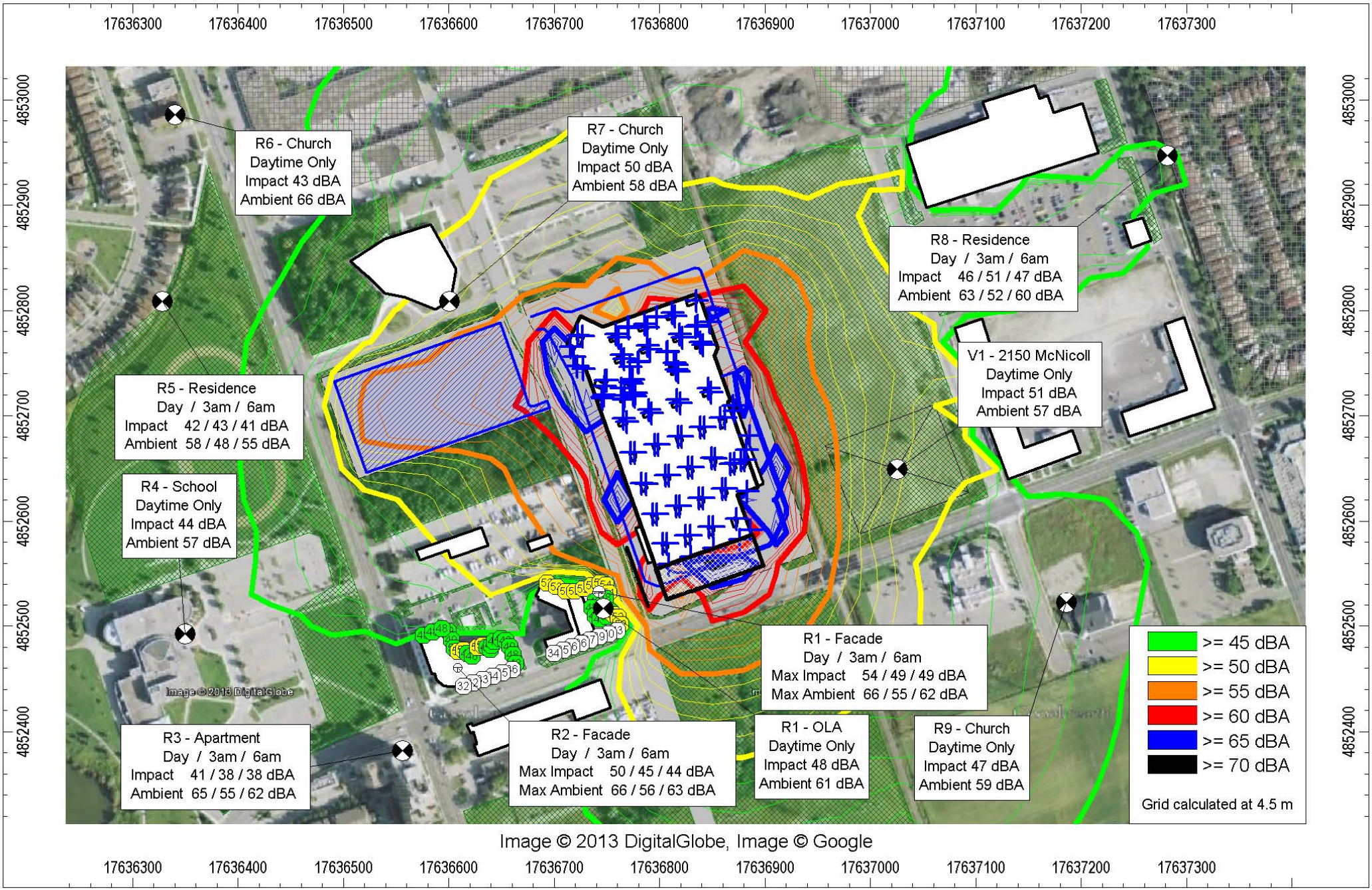

Figure No. **13**

Mitigated Noise Impact Contours
Daytime Operations

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 5,000
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

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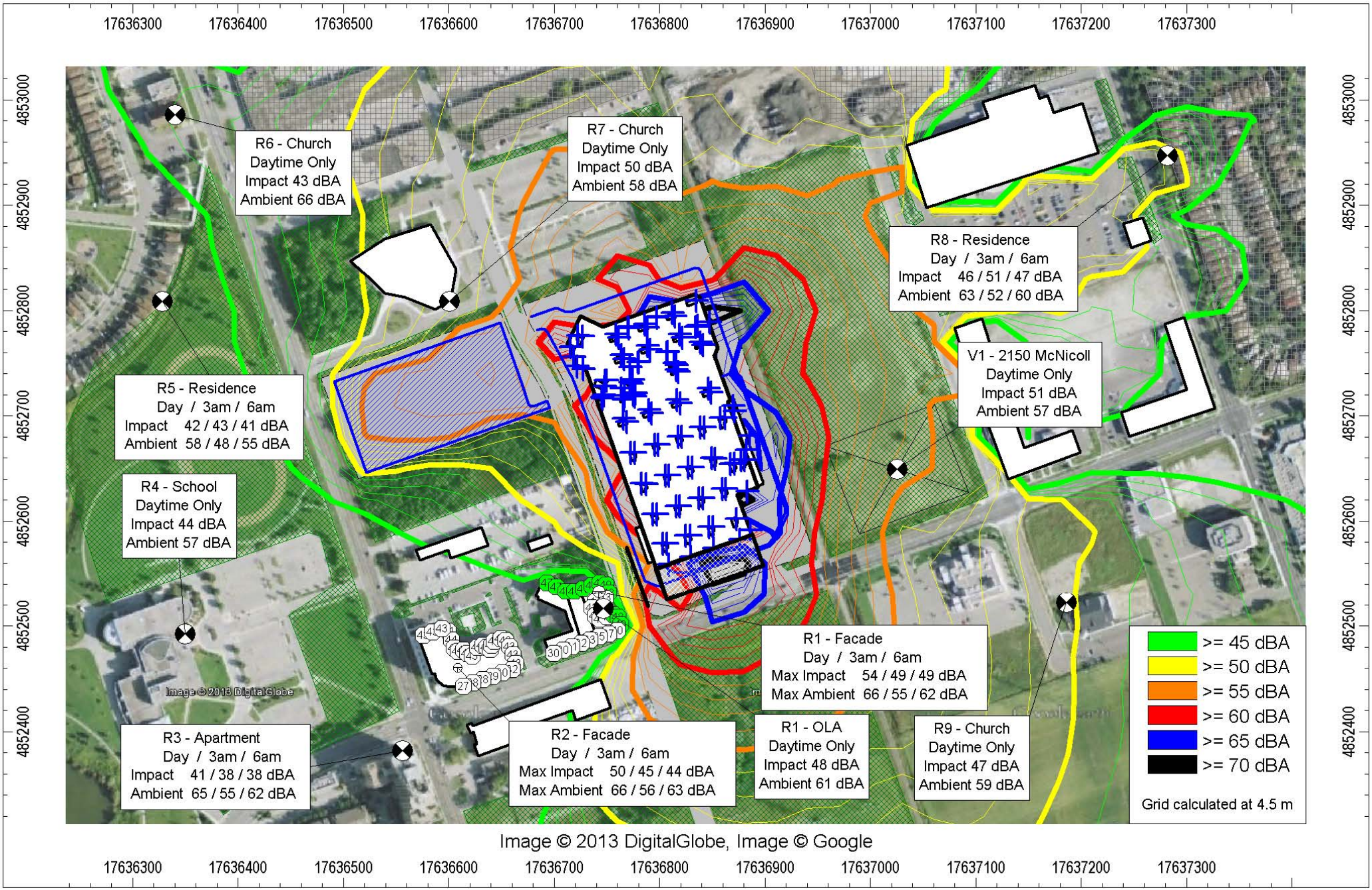

Figure No. **14**

Mitigated Noise Impact Contours
Worst-case 3am Operations

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 5,000
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

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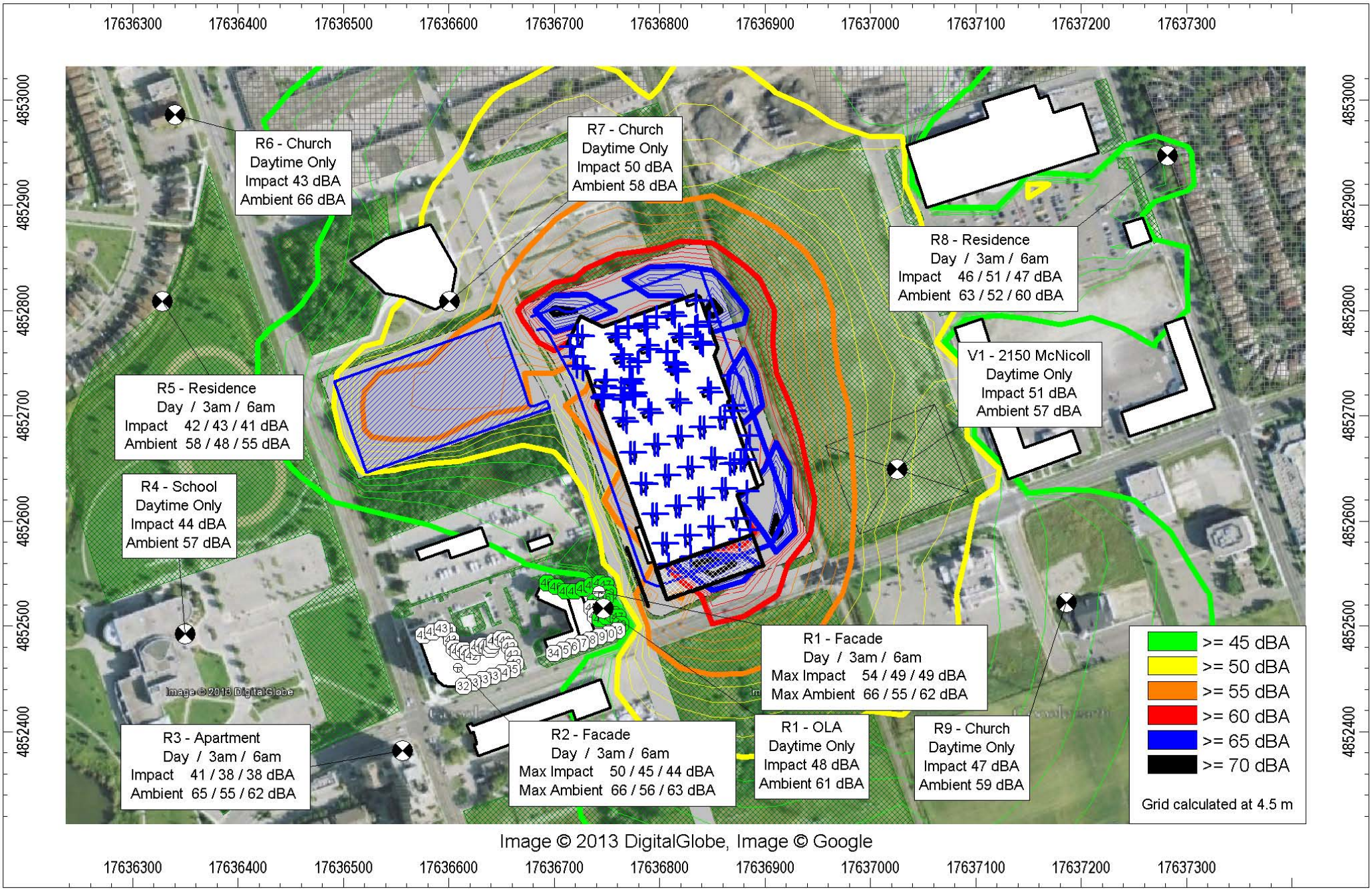

Figure No. **15**

Mitigated Noise Impact Contours
Worst-case 6am Operations

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 5,000
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

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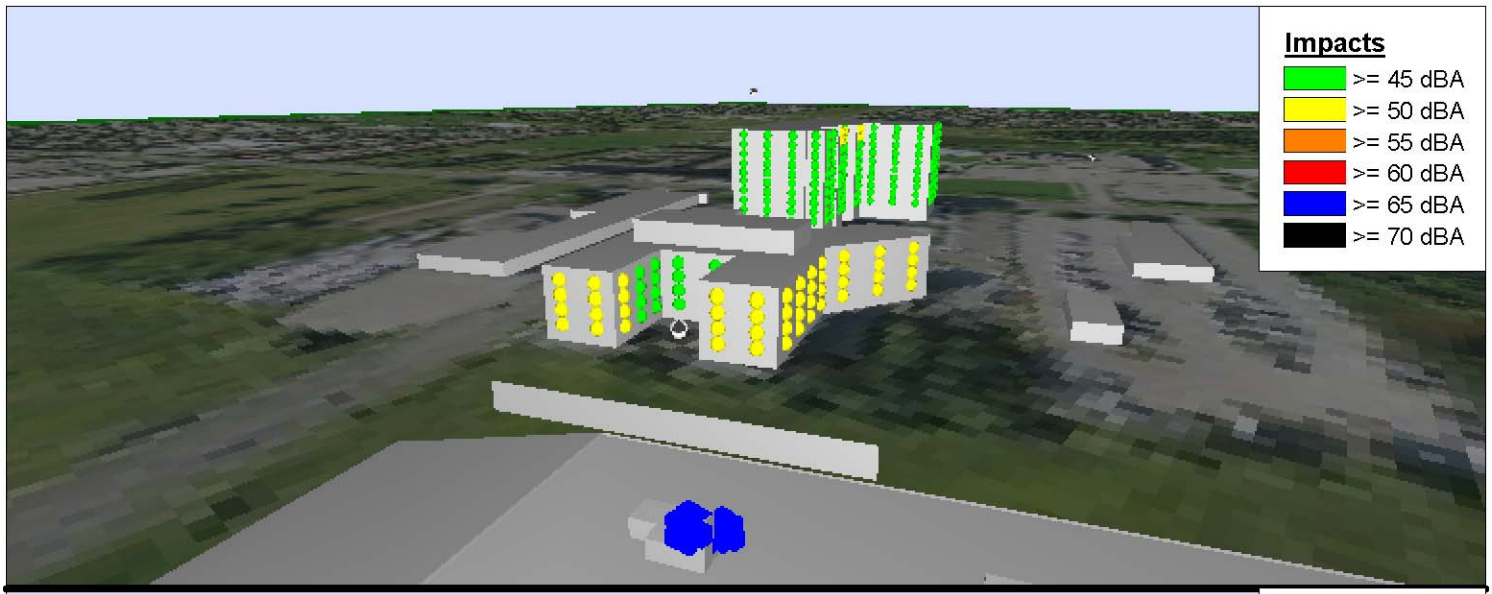

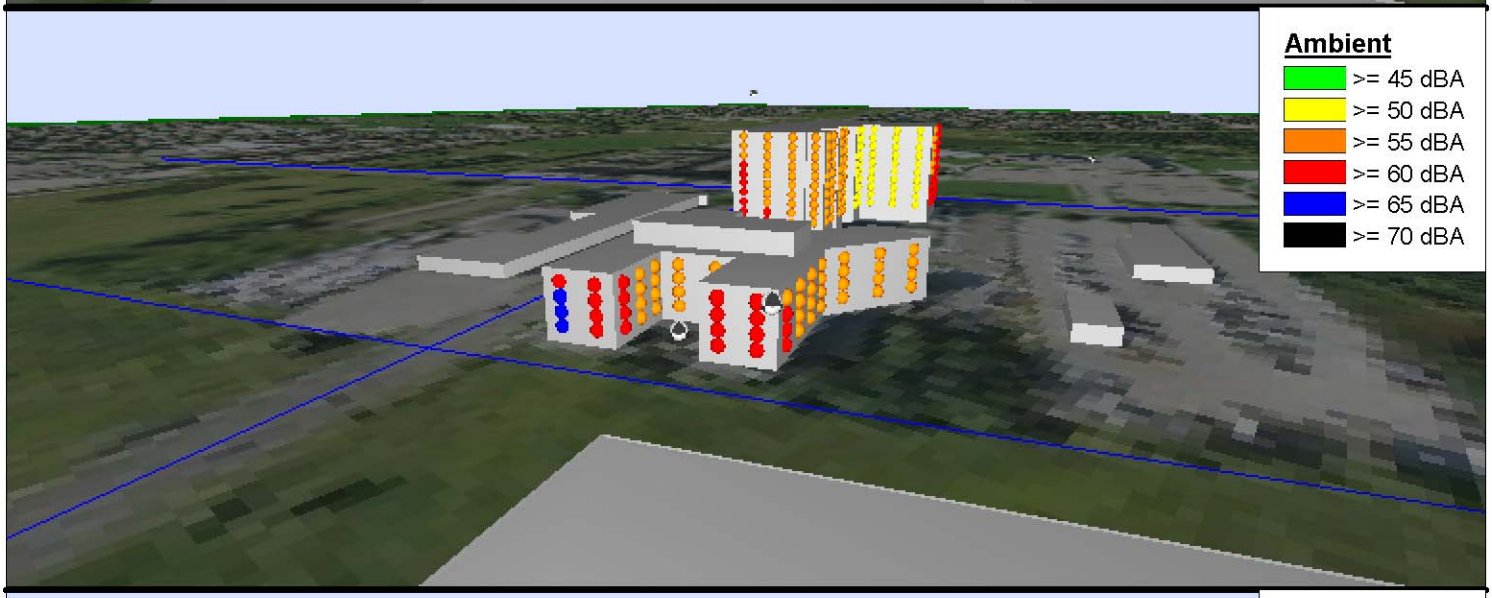

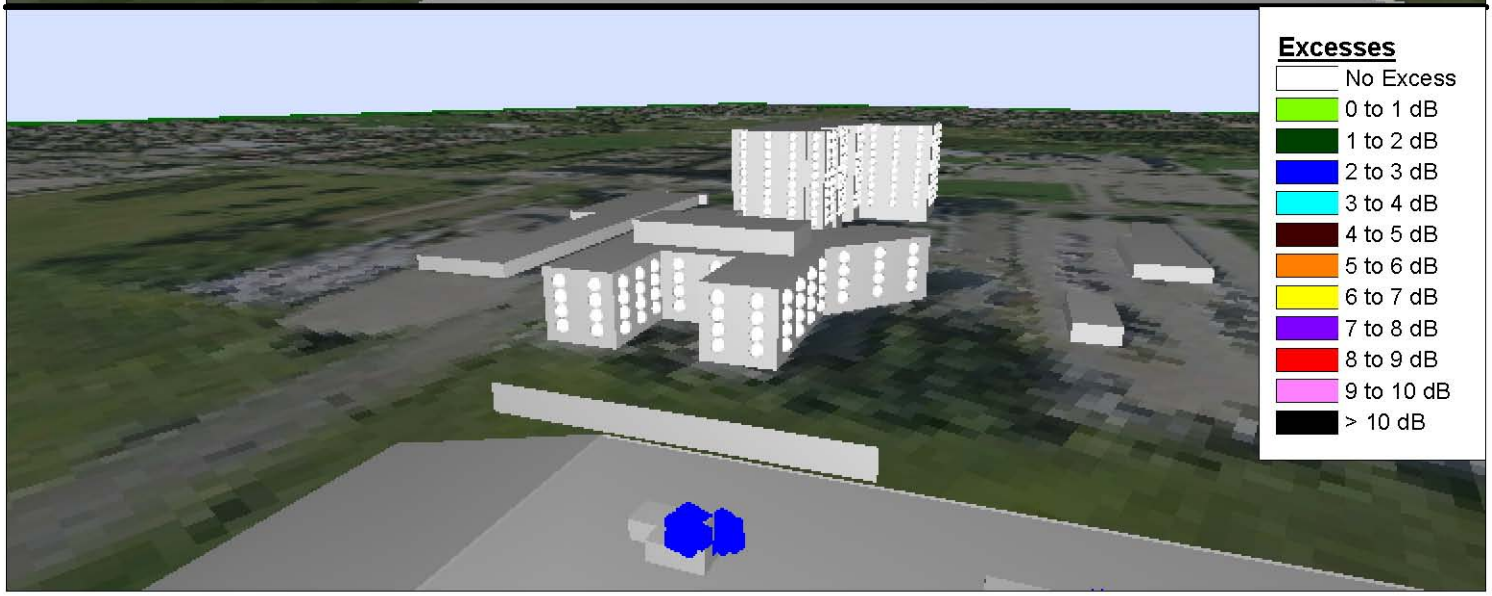

Figure No. **16**

Recommended Mitigation – Daytime
Façade Noise Impacts – Mon Sheong LTC

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: n/a
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

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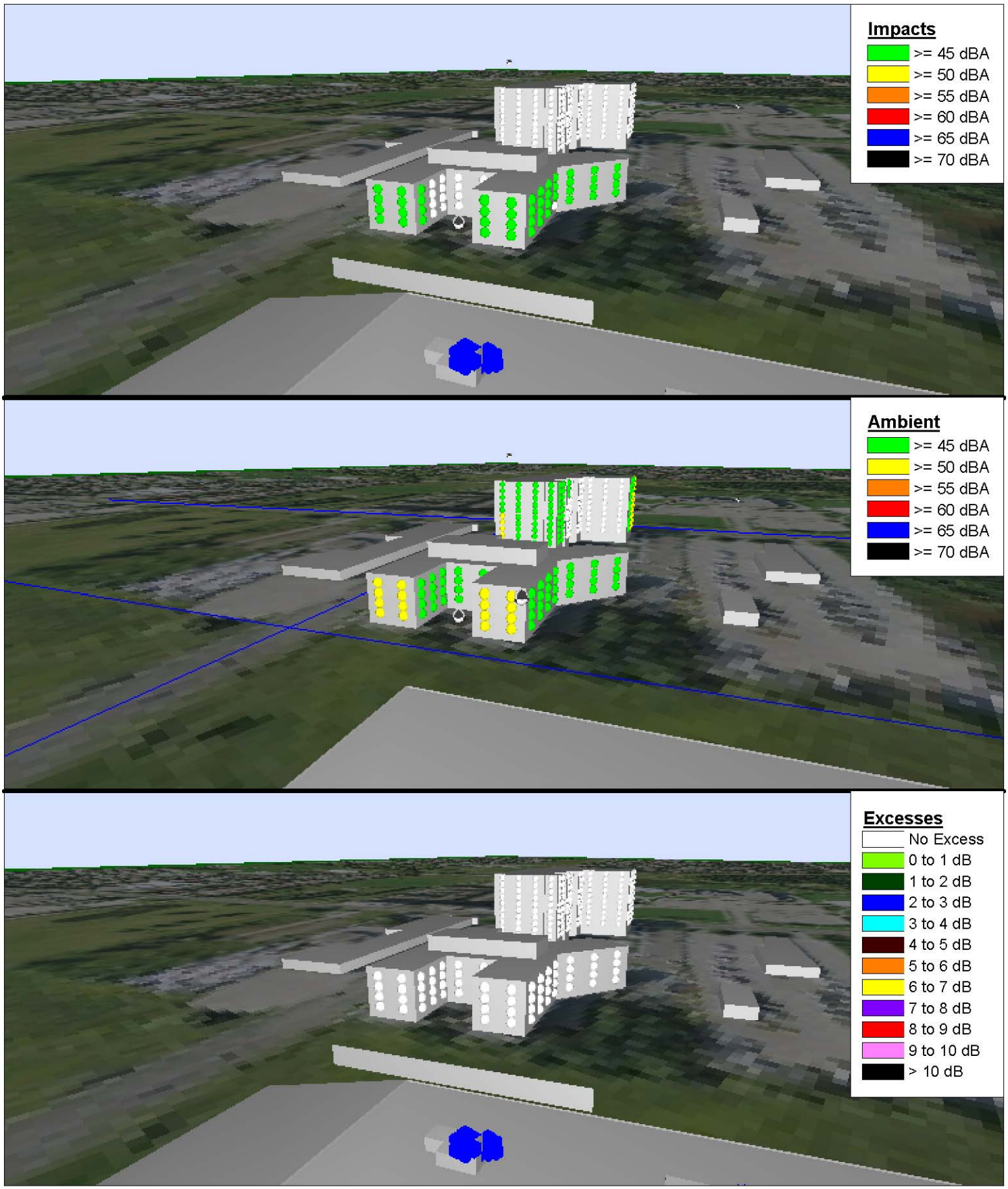

Figure No. **17**

Recommended Mitigation – Worst-case 3am Façade Noise Impacts – Mon Sheong LTC

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: n/a
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

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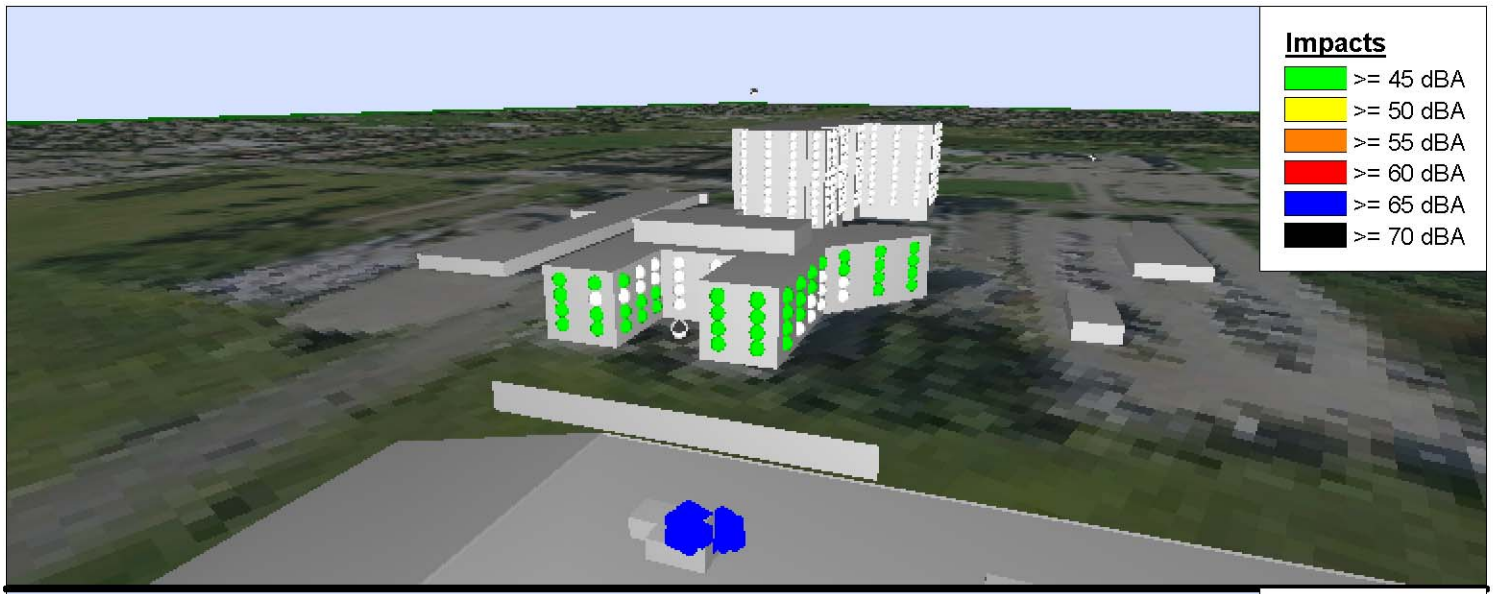

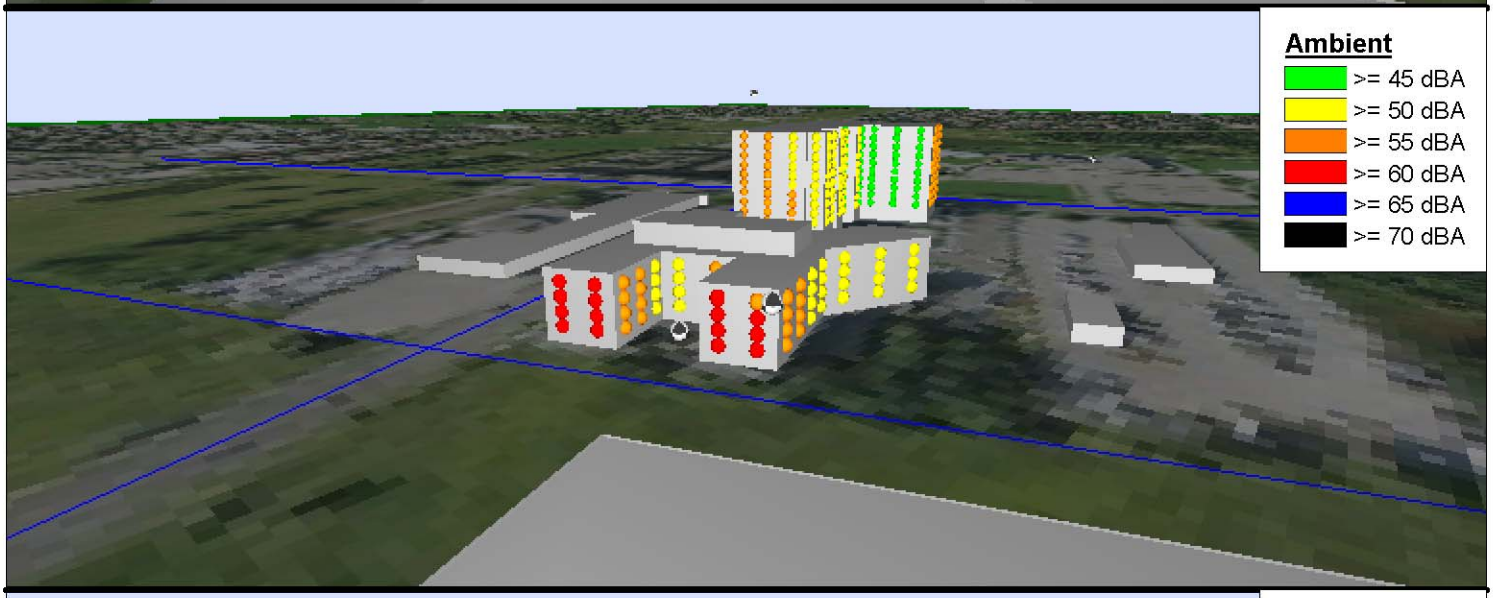

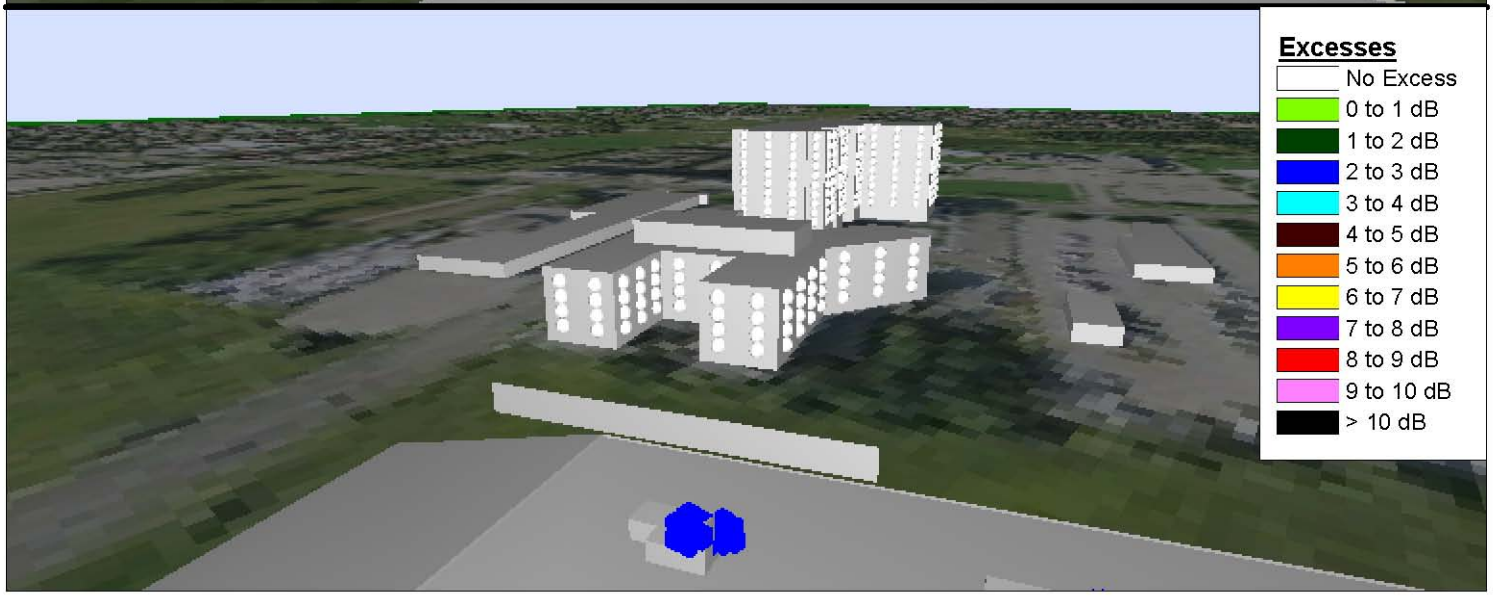

Figure No. **18**

Recommended Mitigation – Worst-case 6am Façade Noise Impacts – Mon Sheong LTC

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: n/a
Date: 14 / 11 / 24
File No.: 13-0054
Drawn By: KAC

novus ENVIRONMENTAL

Appendix A

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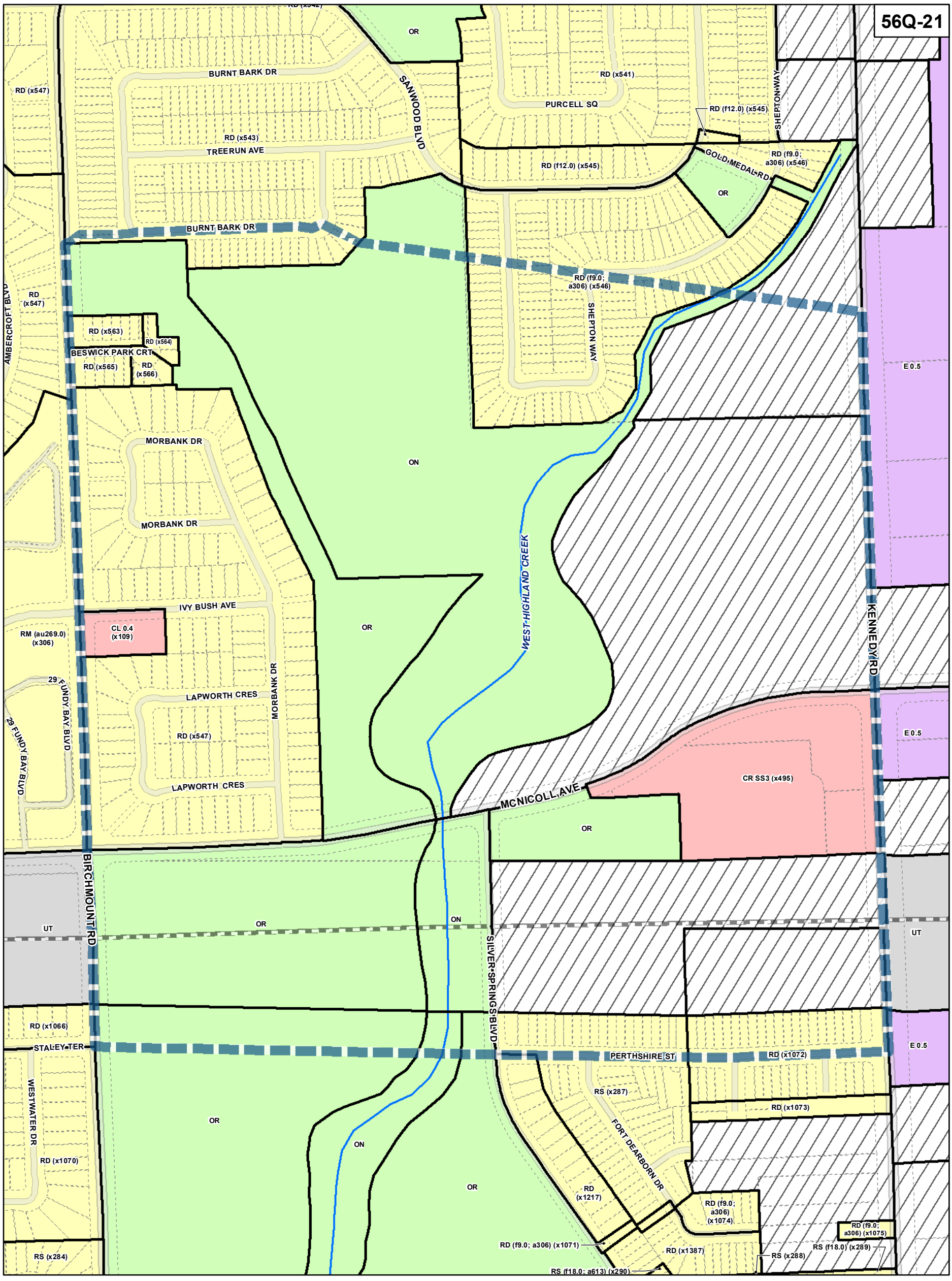

TORONTO City Planning

Zoning *- East District*

August 2010

Maps must be read together with Zoning Bylaw text

Zone Categories

- Residential
- Parks and Open Space
- Commercial Residential
- Commercial Residential Employment
- Institutional
- Employment
- Utility / Transportation
- Not Part of This Bylaw

- Map Sheet Boundary
- Properties
- Railway
- Hydro Line

N

0 20 40 80 120 160 Meters

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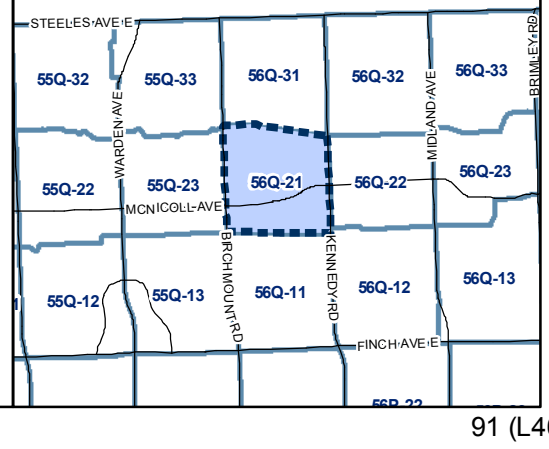

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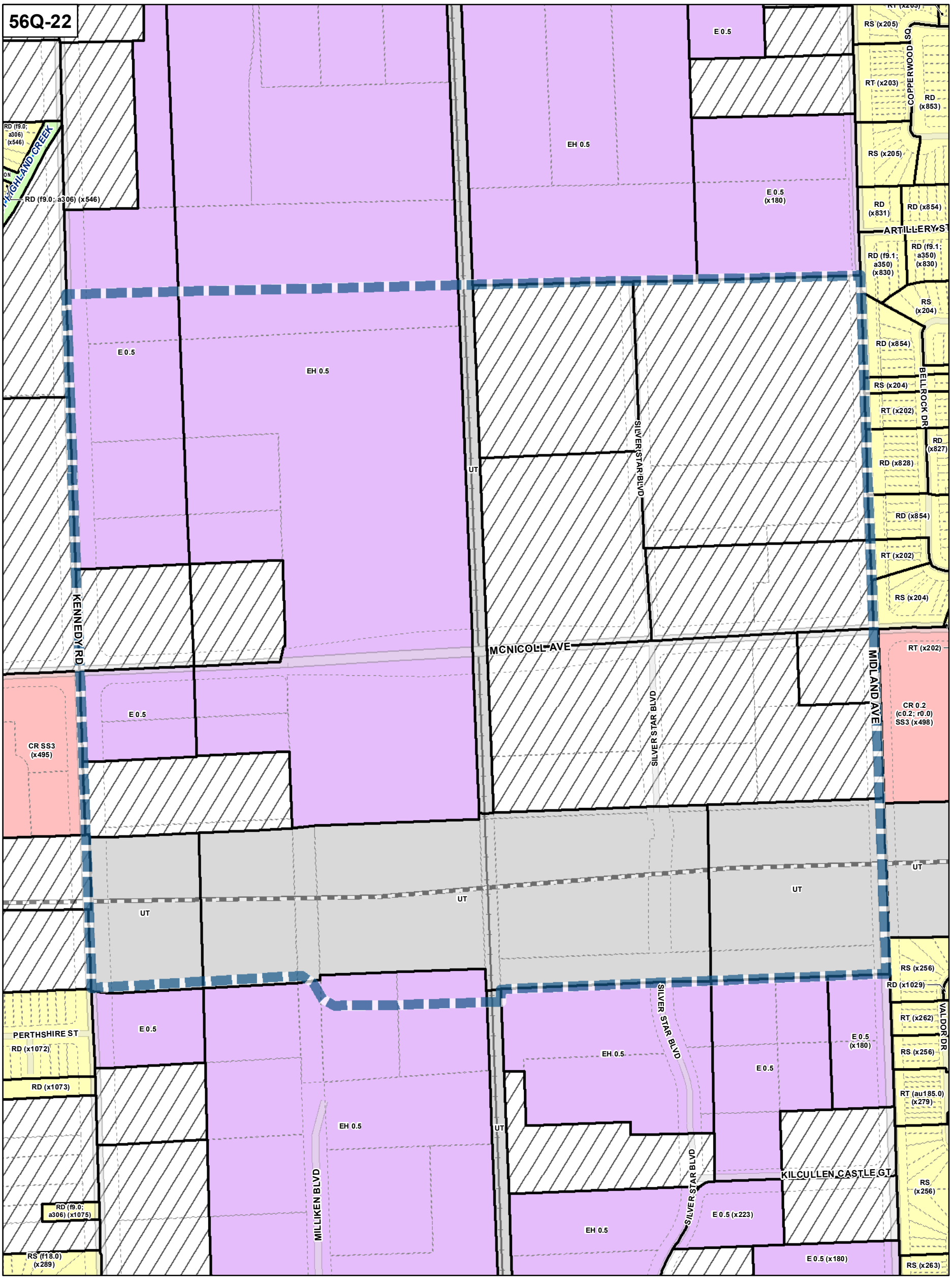
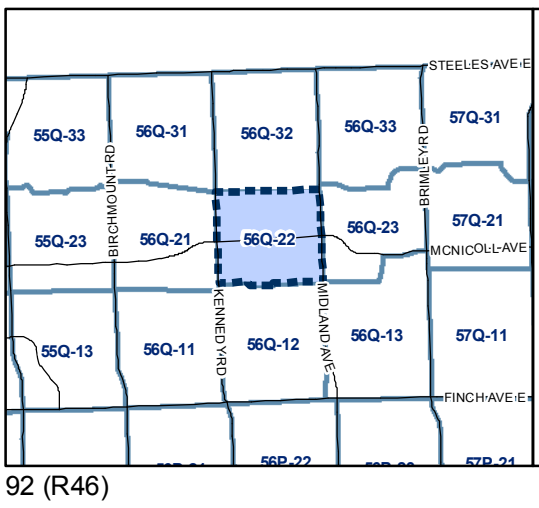




Zone Categories

- Residential
- Parks and Open Space
- Commercial Residential
- Commercial Residential Employment
- Institutional
- Employment
- Utility / Transportation
- Not Part of This Bylaw

- Map Sheet Boundary
- Properties
- Railway
- Hydro Line

N

0 20 40 80 120 160 Meters

1:4,000

TORONTO City Planning

Zoning - East District

August 2010

Maps must be read together with Zoning Bylaw text

City of Toronto Zoning By-law 569-2013, as amended (Office Consolidation)
Version Date: August 19, 2014

Table of Contents

Chapter 60 Employment Industrial

60.30 Employment Heavy Industrial Zone (EH)

60.30.1 General

60.30.1.10 Interpretation

(1) Application of This Section

The regulations in Section 60.30 apply to all lands, uses, **buildings** and **structures** in the EH zone.

(2) Interpretation of the Employment Heavy Industrial Zone Symbol

The zone symbol on the Zoning By-law Map for the Employment Heavy Industrial Zones consists of the letters EH, indicating the primary land use permitted in the respective zone.

(3) Interpretation of the EH Zone Label

In the EH zone, the numerical value following the zone symbol in the zone label ,on the Zoning By-law Map, represents the permitted maximum floor space index of all land uses on a **lot**.

60.30.20 Permitted Uses

60.30.20.1 General

(1) Existing Place of Worship

In the EH zone, a **lawfully existing place of worship** is permitted if it is on a **lot** with a **front lot line** or **side lot line** abutting a major **street** on the Policy Area Overlay Map; and

(A) any expansion or addition to the **place of worship building** must comply with Section 150.50 and the requirements for the EH zone; and

(B) it may be replaced with a new **place of worship building** if it complies with Section 150.50 and the requirements for the EH zone.

60.30.20.10 Permitted Use

(1) Use - EH Zone

In the EH zone, the following uses are permitted:

Ambulance Depot
Animal Shelter
Bindery
Building Supply Yards
Carpenter's Shop
Chemical Materials Storage
Cold Storage
Contractors Establishment
Custom Workshop
Dry Cleaning or Laundry Plant
Fire Hall
Fuel Storage
Industrial Sales and Service Use
Laboratory
Manufacturing Use, if it is not one of the following:
1) Ammunition, Firearms or Fireworks Factory;
2) Crude Petroleum Oil or Coal Refinery;
3) Explosives Factory;
4) Tannery
Police Station
Public Utility
Public Works Yard
Recovery Facility
Service Shop
Shipping Terminal
Vehicle Depot
Vehicle Repair Shop
Warehouse
Waste Transfer Station

60.30.20.20 Permitted Use - with Conditions

(1) Use with Conditions - EH Zone

In the EH zone, the following uses are permitted if they comply with the specific conditions associated with the reference number(s) for each use in Clause 60.30.20.100:

Cogeneration Energy (10)

Crematorium (14)
Open Storage (1)
Outside Operations (2)
Propane Transfer, Handling and Storage Facility (9)
Renewable Energy (10)
Transportation Use (12)
Vehicle Service Shop (5,13)

(1) Use with Conditions - EH Zone

In the EH zone, the following uses are permitted if they comply with the specific conditions associated with the reference number(s) for each use in Clause 60.30.20.100:

Cogeneration Energy (10)
Crematorium (14)
Medical marihuana production facility (3)
Open Storage (1)
Outside Operations (2)
Propane Transfer, Handling and Storage Facility (9)
Renewable Energy (10)
Transportation Use (12)
Vehicle Service Shop (5,13)
[By-law: 0403-2014 Under Appeal]

60.30.20.100 Conditions

(1) Open Storage

In the EH zone:

(A) **open storage** must:

(i) not encroach into a required minimum **building setback**; and

(ii) be enclosed by a fence; and

(B) **open storage** may be for **recyclable material** or waste.

(2) Outside Operations

In the EH zone, outside operations:

(A) must be combined with a permitted **manufacturing use**;

(B) may not encroach into a required minimum **building setback**; and

(C) must be enclosed by a fence.

(3) (THIS DOES NOT CURRENTLY CONTAIN A REGULATION)

(3) Medical Marihuana Production Facility

In the E zone, a **medical marihuana production facility** must comply with the specific use regulations in Section 150.60.
[By-law: 0403-2014 Under Appeal]

(4) (THIS DOES NOT CURRENTLY CONTAIN A REGULATION)

(5) Vehicle Service Shop

In the EH zone, a **vehicle service shop** must comply with the specific use regulations in Section 150.94.

(6) (THIS DOES NOT CURRENTLY CONTAIN A REGULATION)

(7) (THIS DOES NOT CURRENTLY CONTAIN A REGULATION)

(8) (THIS DOES NOT CURRENTLY CONTAIN A REGULATION)

(9) Propane Transfer, Handling and Storage Facility

In the EH zone, a propane transfer, handing and storage facility pertains to facilities which transfer, handle, or store propane in quantities equal to or greater than 5,000 U.S. Water Gallons (USWG) on the **lot**, and:

(A) may be on a **lot** that is at least 500 metres from a **lot** in the Residential Zone category, Residential Apartment Zone category, Commercial Zone category, Commercial Residential Zone category, Commercial Residential Employment Zone category, Institutional Zone category, or Open Space Zone category; and

(B) is not a permitted **manufacturing use** that involves propane in the manufacturing process, or in the operation of equipment or **vehicles** that is not subject to regulation (A) above.

(10) Renewable Energy Production or Cogeneration Energy Production

In a EH zone, **renewable energy** production or **cogeneration energy** production must be in combination with another permitted use on the **lot**, and comply with all Municipal, Provincial and Federal by-laws, statutes and regulations.

(11) (THIS DOES NOT CURRENTLY CONTAIN A REGULATION)

(12) Transportation Use

A **building** or **structure** on a **lot** in the EH zone and used as a **transportation use** must comply with all requirements for a **building** on that **lot**.

(13) Vehicle Service Shop - Open Storage

In the EH zone, a **vehicle service shop** may have **open storage** if it is:

(A) less than 20% of the area of the **lot** that is not covered by wholly enclosed **buildings**; and

(B) enclosed by a fence.

(14) Crematorium

In the EH zone, a **crematorium** must be a minimum of 300 metres from a **lot** that is not in the EL, E, EH or UT zone.

60.30.30 Lot Requirements

60.30.30.20 Lot Frontage

(1) Minimum Lot Frontage for Lots in the EH zone

In the EH zone, the required minimum **lot frontage** is 30.0 metres.

60.30.30.21 Lot Frontage Exemptions

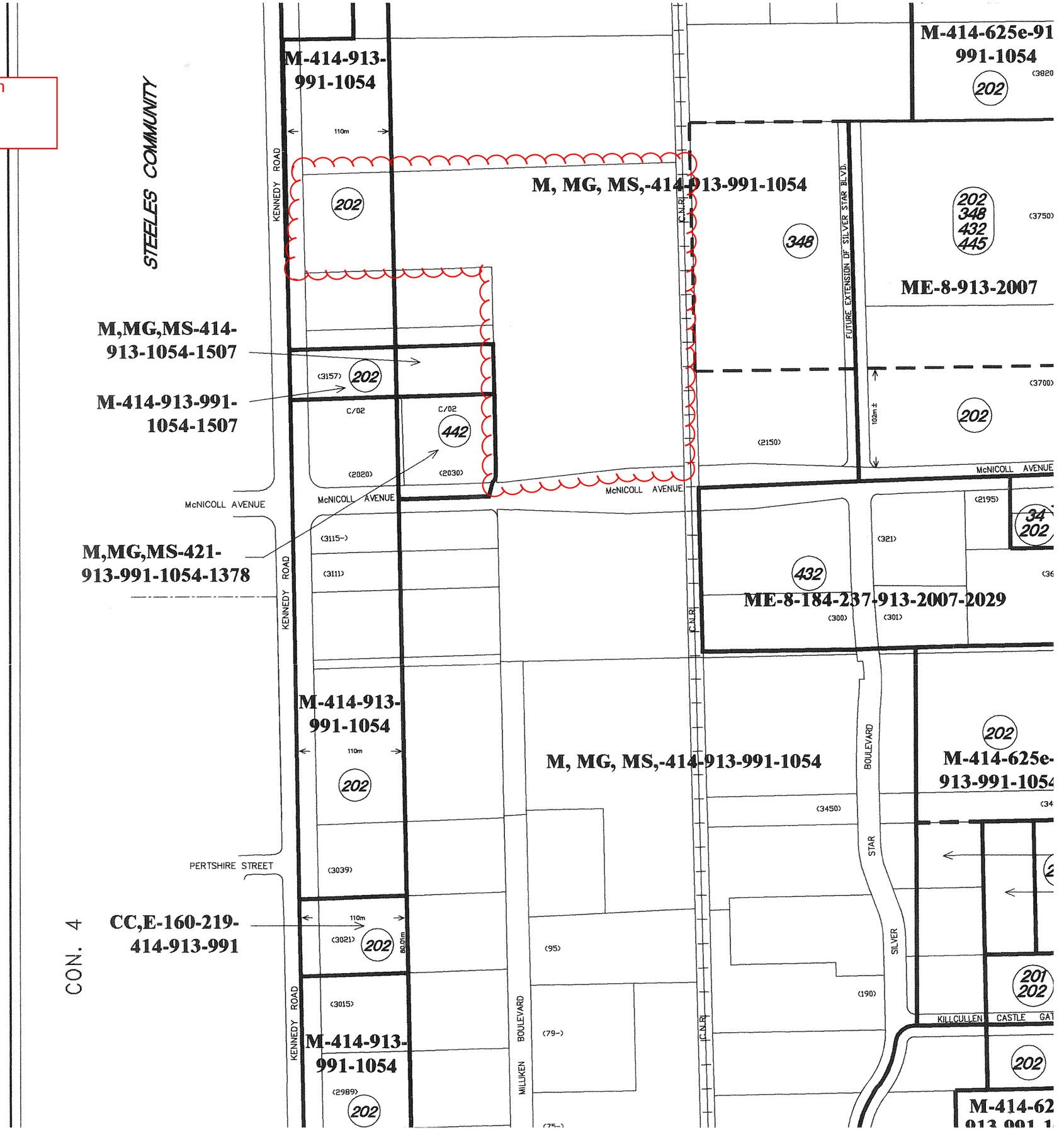
(1) Permitted Lot Frontage for Lawfully Existing Lots

In the EH zone, if the **lawful lot frontage** of a **lawfully existing lot** is less than the required minimum **lot frontage**, that **lawful lot frontage** is the minimum **lot frontage** for that **lawfully existing lot**.

(2) Additions to Lawfully Existing Buildings

Any addition or extension to a **lawfully existing building** or **structure** on a **lot** referred to in regulation 60.30.30.21(1) must comply with all other applicable regulations of this By-law or be authorized by a Section 45 Planning Act minor variance.

Map Excerpted from Scarborough General Zoning By-law 24982



CLAUSE VI - ZONE PROVISIONS

NOTE: *PLEASE REFER BACK TO THE* ***CLAUSE III - INTERPRETATION****,* ***CLAUSE IV - DEFINITIONS*** *AND* ***CLAUSE V - GENERAL PROVISIONS*** *SECTIONS OF THE BY-LAW TO ENSURE COMPLIANCE WITH THOSE PROVISIONS OF THE BY-LAW.*

1. Industrial Zone (M)

(a) Permitted Uses

- **Day Nurseries**
- Educational and Training Facility Uses
- **Industrial Uses**
- Offices, excluding Medical and Dental Offices
- **Places of Worship**
- **Recreational Uses**

(b) Supplementary Regulations

(i) All uses shall be conducted wholly within an enclosed building.

2. General Industrial Zone (MG)

(a) Permitted Uses

- **Day Nurseries**
- Educational and Training Facility Uses
- **Industrial Uses**
- Offices, excluding Medical and Dental Offices
- **Open Storage**
- **Places of Worship**
- **Recreational Uses**

3. Special Industrial Zone (MS)

(a) Permitted Uses

- **Day Nurseries**
- Educational and Training Facility Uses
- **Industrial Uses**
- Offices, excluding Medical and Dental Offices

- **Open Storage**
- **Places of Worship**
- **Recreational Uses**
- **Special Industrial Uses**

4. Mixed Employment Zone (ME)

(a) Permitted Uses

- **Day Nurseries**
- Educational and Training Facility Uses
- **Financial Institutions**
- **Industrial Uses**
- Offices
- **Personal Service Shops**
- **Places of Worship**
- **Recreational Uses**
- **Restaurants**
- Retail Stores

(b) Supplementary Regulations

(i) All Uses shall be conducted wholly within an enclosed building

5. Employment Zone (E)

(a) Permitted Uses

- **Day Nurseries**
- Educational and Training Facility Uses
- **Industrial Uses**
- Offices
- **Places of Worship**
- **Recreational Uses**

6. Office Uses Zone (OU)

(a) Permitted Uses:

- **Day Nurseries**
- Educational and Training Facility Uses
- **Financial Institutions**
- Libraries

Appendix B

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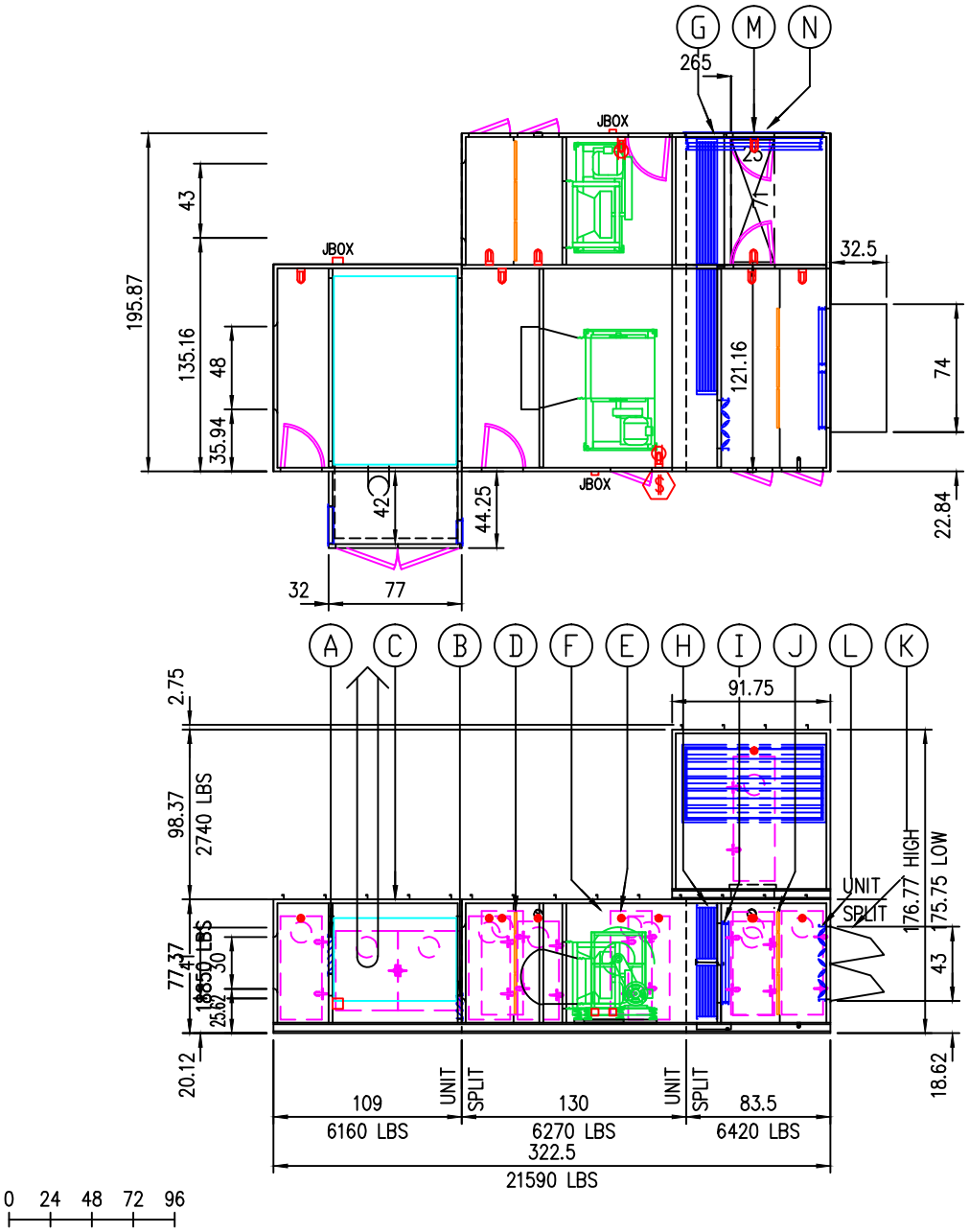
for 2-sided printing purposes



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 1750
FUEL PRESSURE: 0.500 psi
INPUT : 2250 MBH OUTPUT : 1800 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 500 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 6 @ 24 X 24 3 @ 24 X 12

(E) FAN : (RF) 27" EPF SW, Arrangement-3
AIR FLOW : 15000 CFM RPM : 1677
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG75 η_{pt}: 73% η_t / η_{pt} : 94%

(F) FAN : (SF) 24" BAE DW, Arrangement-3
AIR FLOW : 15000 CFM RPM : 1499
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 15 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG85 η_{pt}: 82% η_t / η_{pt} : 99%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 30 X 144

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 48 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 500 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 6 @ 24 X 24 3 @ 24 X 12

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 71 X 44

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 42

(N) LOUVRE SIZE : 80 X 42
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

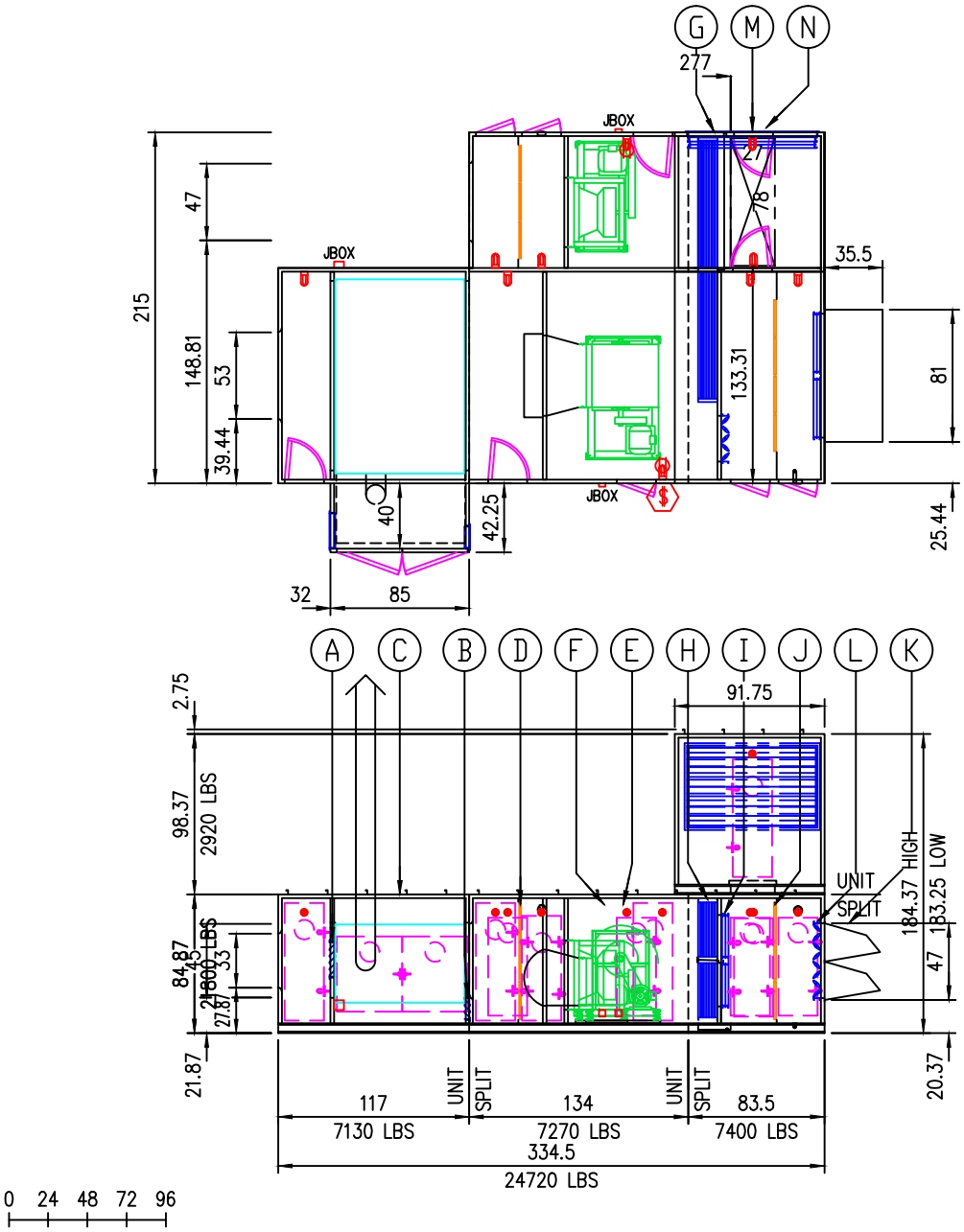
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U26SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-1-3	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 2000
FUEL PRESSURE: 0.500 psi
INPUT : 2500 MBH OUTPUT : 2000 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 500 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 9 @ 24 X 24

(E) FAN : (RF) 30" EPF SW, Arrangement-3
AIR FLOW : 18000 CFM RPM : 1480
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG80 η_{pt}: 74% η_t / η_{pt} : 95%

(F) FAN : (SF) 27" BAE DW, Arrangement-3
AIR FLOW : 18000 CFM RPM : 1369
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 85% η_t / η_{pt} : 97%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 33.75 X 158

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 58 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 375 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 12 @ 24 X 24

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 78 X 48

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 50

(N) LOUVRE SIZE : 80 X 50
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

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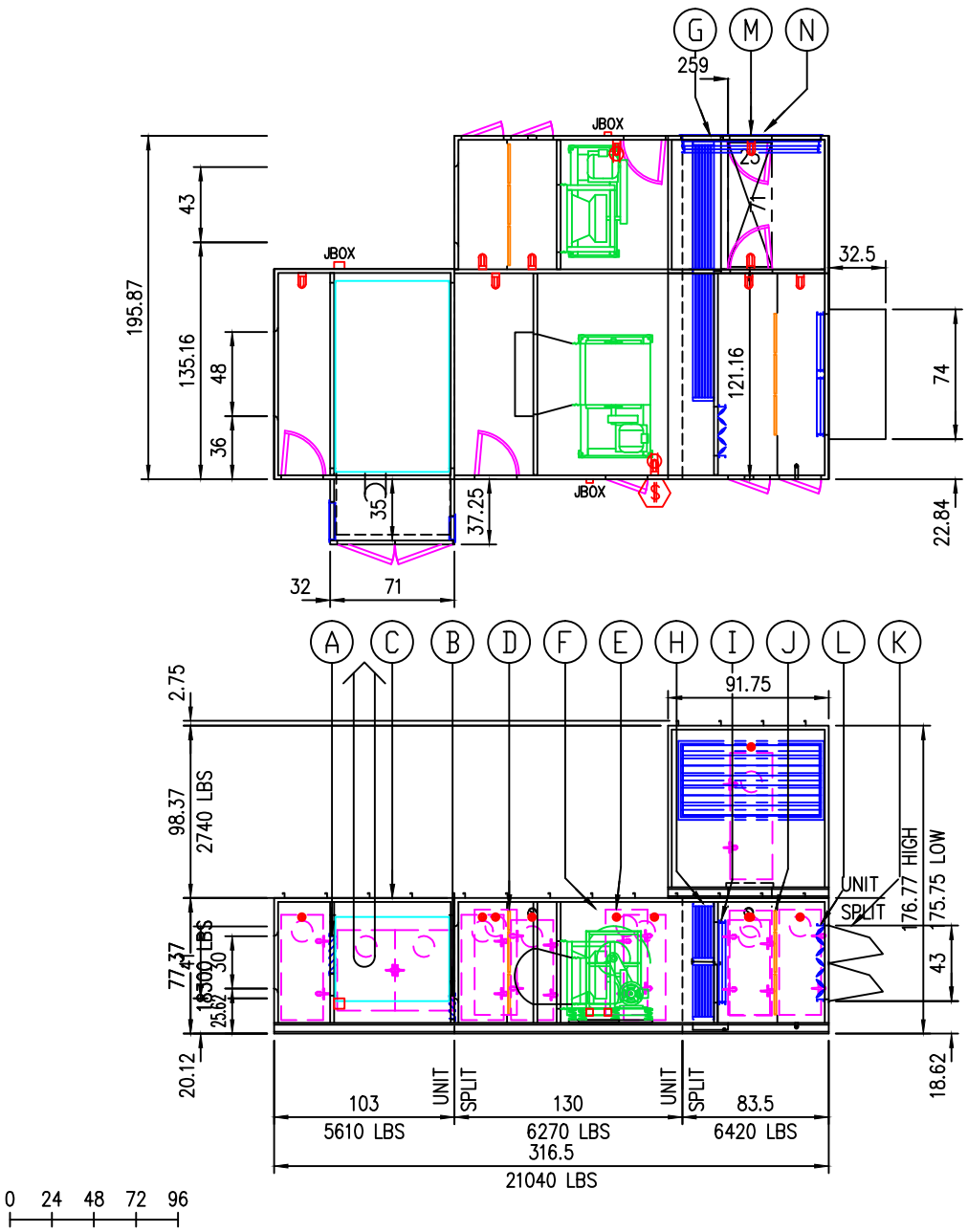
OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U30SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-4	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 1500
FUEL PRESSURE: 0.500 psi
INPUT : 1875 MBH OUTPUT : 1500 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 500 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 6 @ 24 X 24 3 @ 24 X 12

(E) FAN : (RF) 27" EPF SW, Arrangement-3
AIR FLOW : 15000 CFM RPM : 1677
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG75 η_{pt}: 73% η_t / η_{pt} : 94%

(F) FAN : (SF) 24" BAE DW, Arrangement-3
AIR FLOW : 15000 CFM RPM : 1499
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 15 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG85 η_{pt}: 82% η_t / η_{pt} : 99%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 30 X 144

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 48 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 500 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 6 @ 24 X 24 3 @ 24 X 12

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 71 X 44

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 42

(N) LOUVRE SIZE : 80 X 42
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

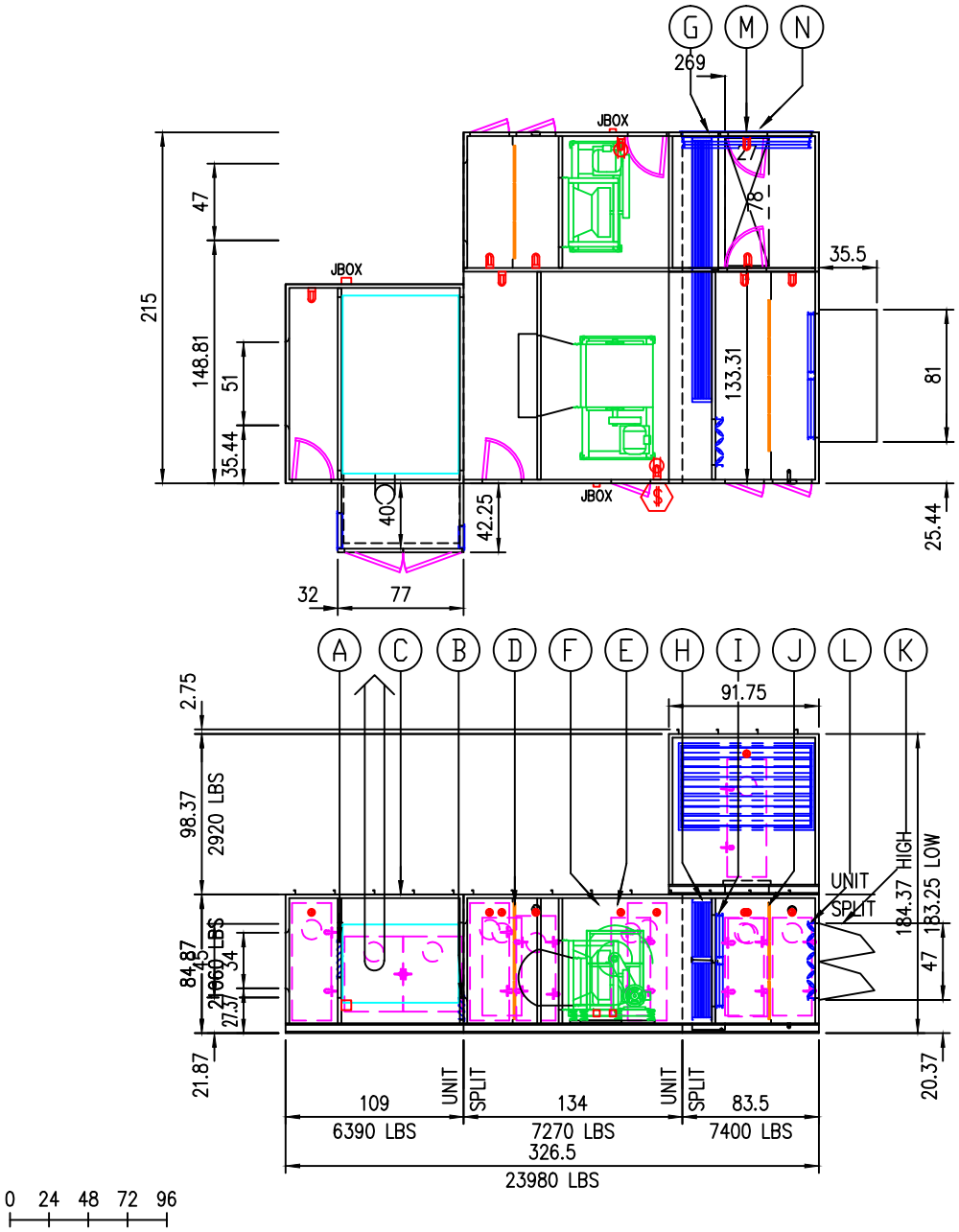
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U31SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	5-7,9-11,13-15	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 1750
FUEL PRESSURE: 0.500 psi
INPUT : 2250 MBH OUTPUT : 1800 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 500 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 9 @ 24 X 24

(E) FAN : (RF) 30" EPF SW, Arrangement-3
AIR FLOW : 18000 CFM RPM : 1480
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG80 η_{pt}: 74% η_t / η_{pt} : 95%

(F) FAN : (SF) 27" BAE DW, Arrangement-3
AIR FLOW : 18000 CFM RPM : 1369
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 85% η_t / η_{pt} : 97%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 33.75 X 158

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 58 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 375 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 12 @ 24 X 24

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 78 X 48

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 50

(N) LOUVRE SIZE : 80 X 50
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

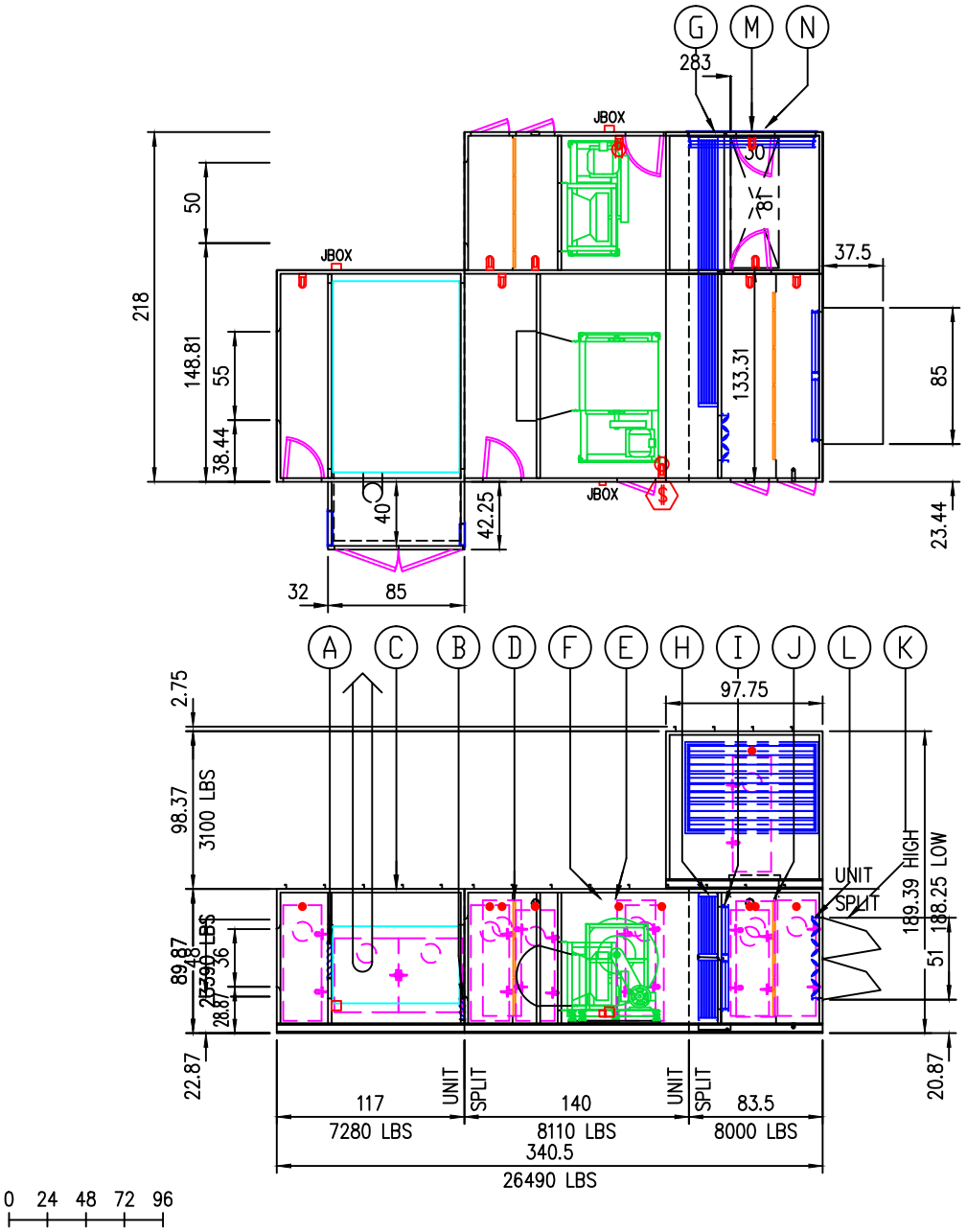
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U32SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-8,12,16	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 2000
FUEL PRESSURE: 0.500 psi
INPUT : 2500 MBH OUTPUT : 2000 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 488 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 3 @ 24 X 12 9 @ 24 X 24

(E) FAN : (RF) 30" EPF SW, Arrangement-3
AIR FLOW : 20500 CFM RPM : 1602
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 25 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG80 η_{pt}: 74% η_t / η_{pt} : 92%

(F) FAN : (SF) 30" BAE DW, Arrangement-3
AIR FLOW : 20500 CFM RPM : 1190
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 85% η_t / η_{pt} : 99%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 36.25 X 164

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 66 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 380 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 12 @ 24 X 24 3 @ 24 X 12

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 82 X 52

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 54

(N) LOUVRE SIZE : 80 X 54
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

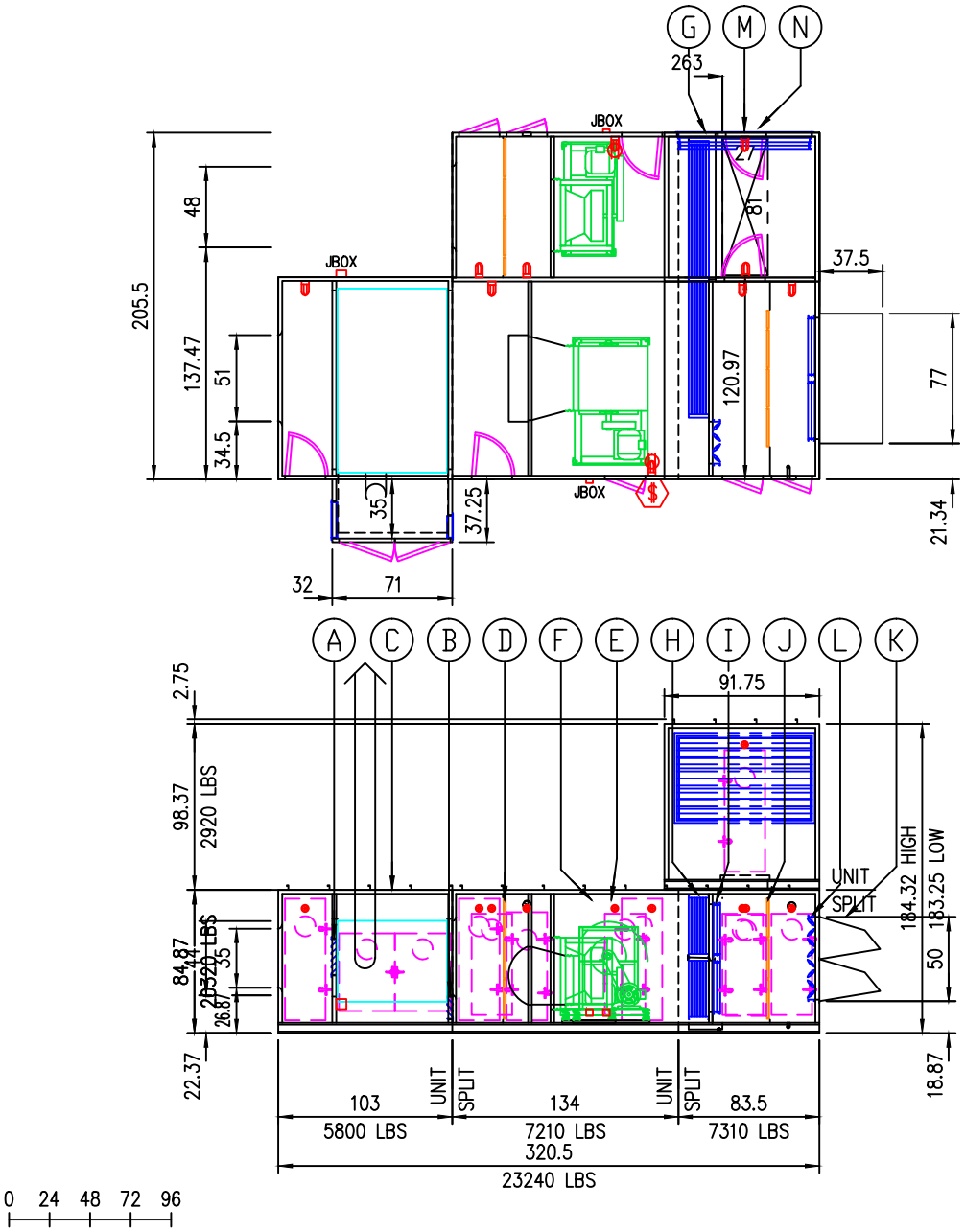
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U33SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-17-20	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 1500
FUEL PRESSURE: 0.500 psi
INPUT : 1875 MBH OUTPUT : 1500 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 436 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 3 @ 24 X 12 9 @ 24 X 24

(E) FAN : (RF) 30" EPQ SW, Arrangement-3
AIR FLOW : 18300 CFM RPM : 1506
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG75 η_{pt}: 73% η_t / η_{pt} : 90%

(F) FAN : (SF) 27" BAE DW, Arrangement-3
AIR FLOW : 18300 CFM RPM : 1379
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 85% η_t / η_{pt} : 97%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 33.75 X 160

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 66 X 27

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 436 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 9 @ 24 X 24 3 @ 24 X 12

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 74 X 51

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 50

(N) LOUVRE SIZE : 80 X 50
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

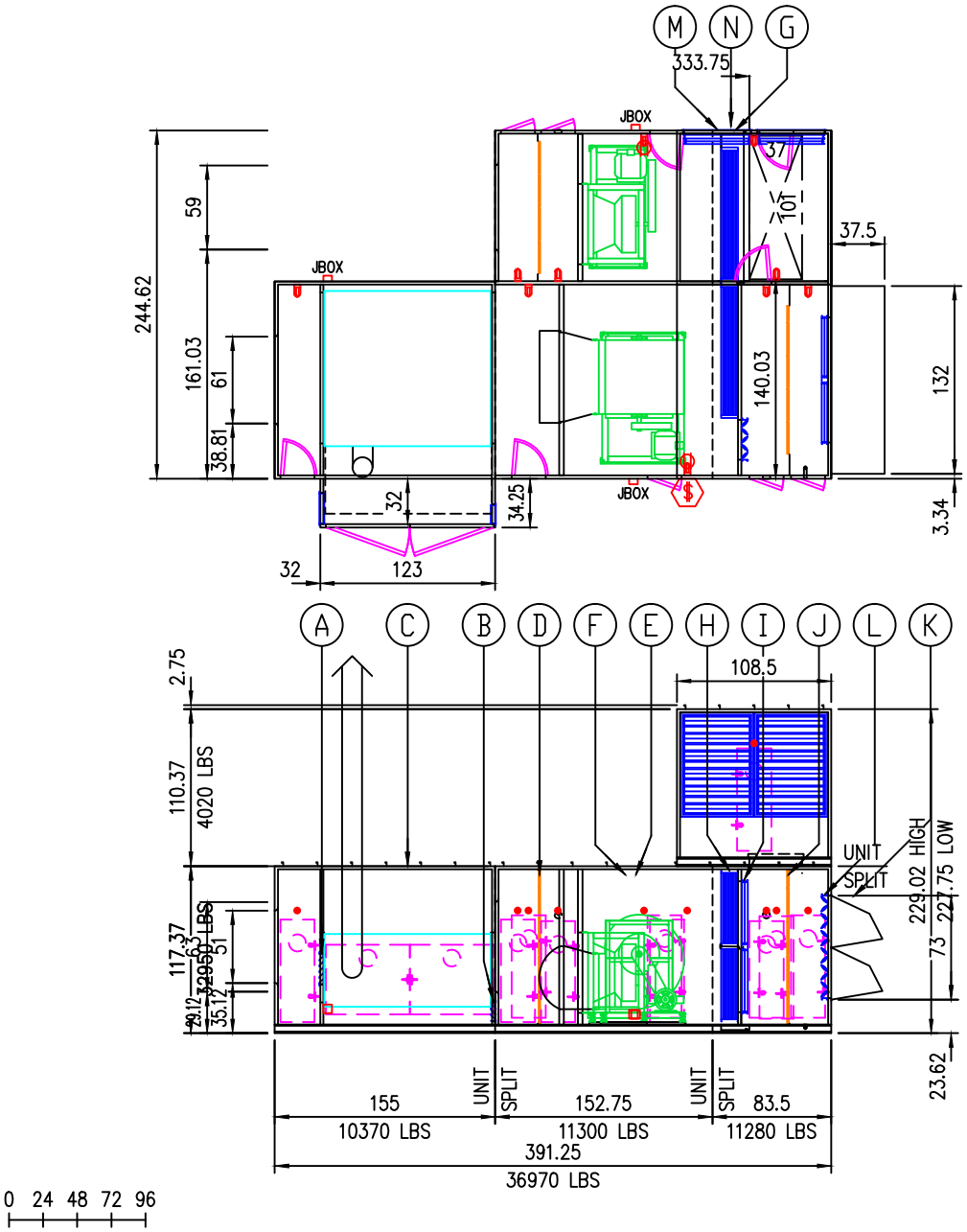
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U34SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-21,22	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 3000
FUEL PRESSURE: 0.500 psi
INPUT : 3750 MBH OUTPUT : 3000 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 446 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 16 @ 24 X 24 4 @ 24 X 12

(E) FAN : (RF) 40" EPF SW, Arrangement-3
AIR FLOW : 32100 CFM RPM : 1070
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 40 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG80 η_{pt}: 76% η_t / η_{pt} : 96%

(F) FAN : (SF) 36" BAE DW, Arrangement-3
AIR FLOW : 32100 CFM RPM : 982
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 30 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 85% η_t / η_{pt} : 99%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 50 X 186

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 94 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 401 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 16 @ 24 X 24 8 @ 24 X 12

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 90 X 74

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 2 @ 48 X 70

(N) LOUVRE SIZE : 100 X 70
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

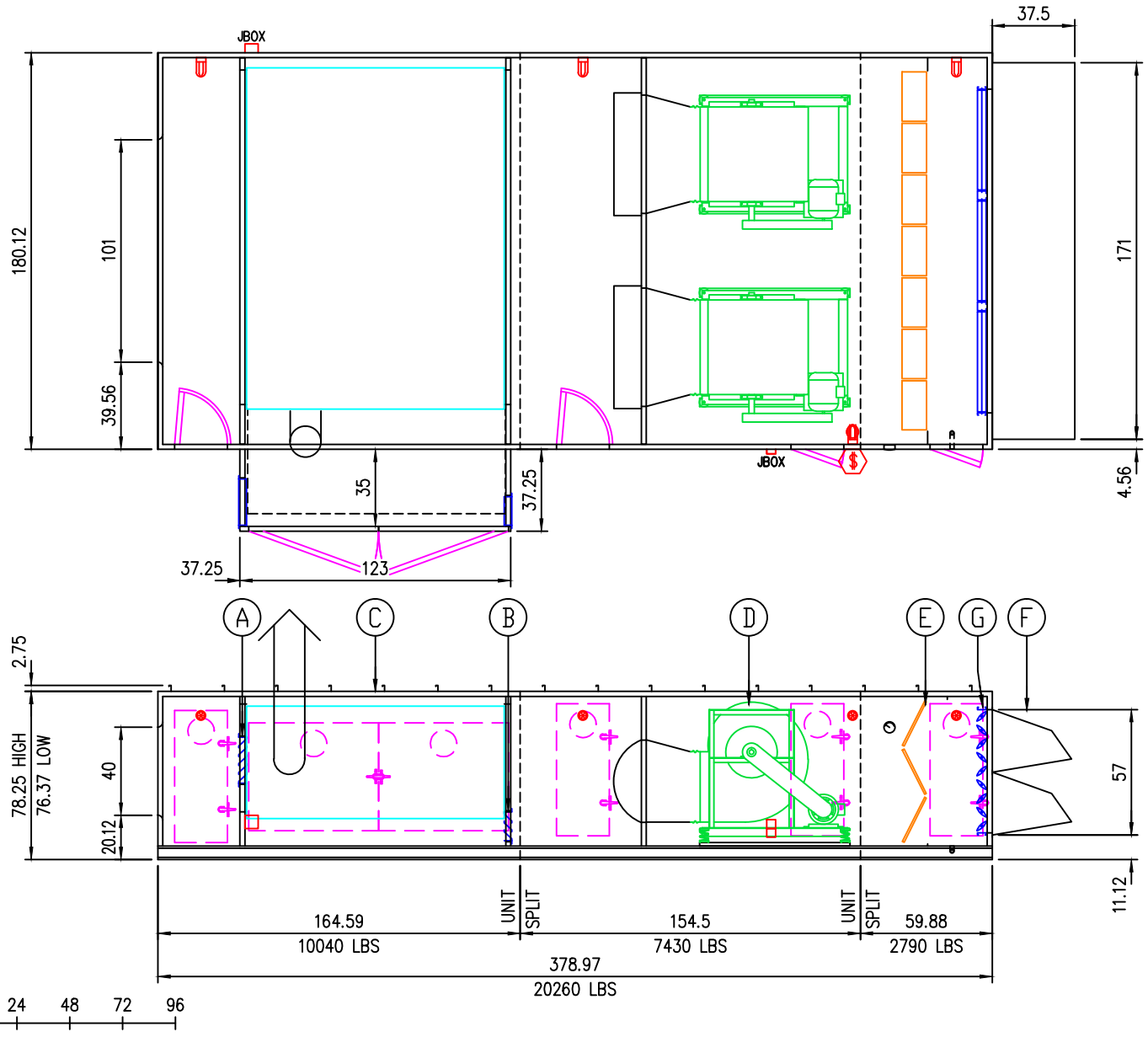
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U35SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-23	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 4000
FUEL PRESSURE: 0.500 psi
INPUT : 5000 MBH OUTPUT : 4000 MBH

(D) FAN : (SF) 2 @ 30" BAE DW, Arrangement-3
AIR FLOW : 21000 CFM RPM : 1178
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 85% η_t / η_{pt} : 98%

(E) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 500 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 21 @ 24 X 24

(F) OA HOOD
TYPICAL OF 2

(G) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 149 X 58

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

SDG VER: Jun 20 2014

PROJECT

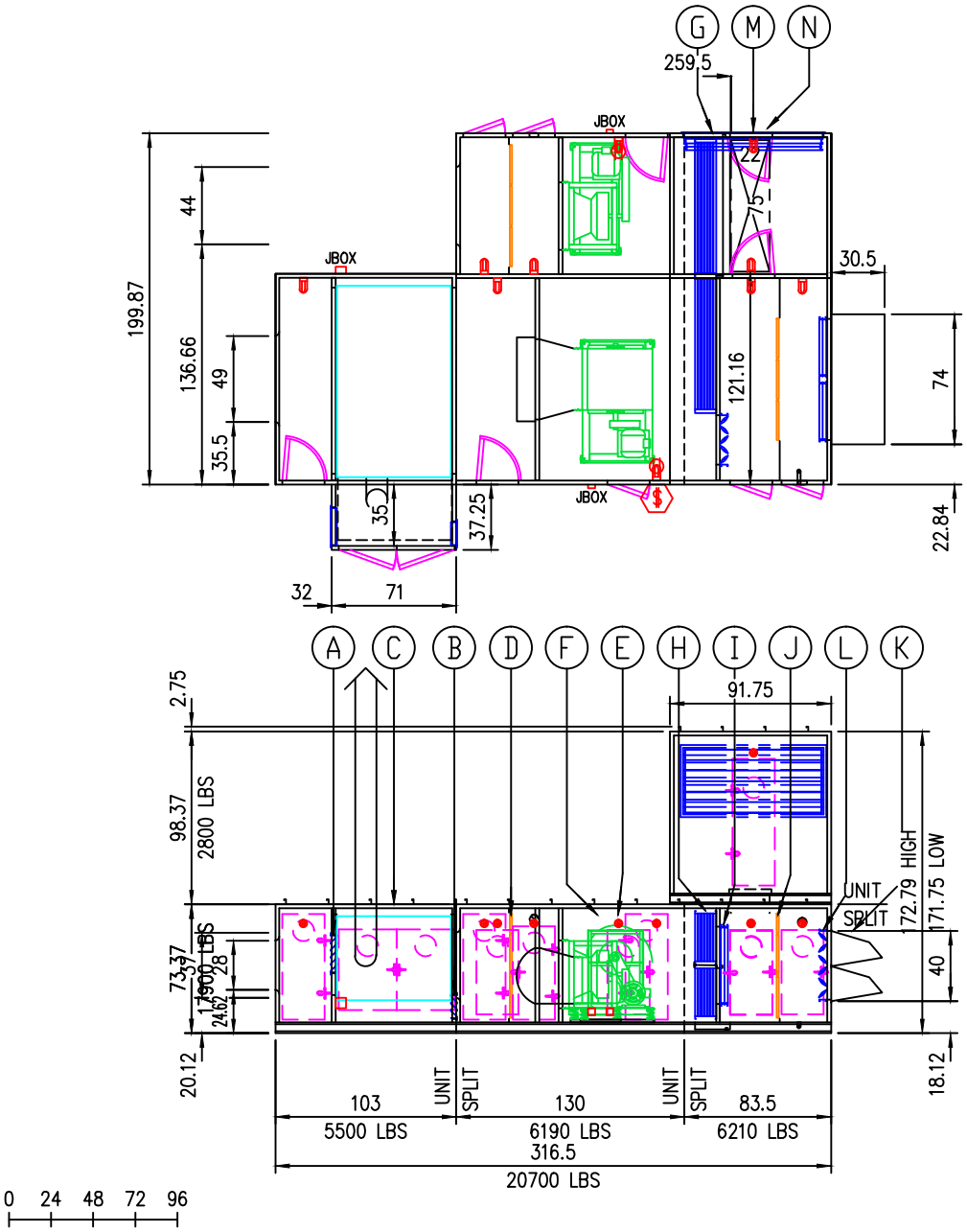
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U36SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-24	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 1500
FUEL PRESSURE: 0.500 psi
INPUT : 1875 MBH OUTPUT : 1500 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 470 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 6 @ 24 X 24 3 @ 24 X 12

(E) FAN : (RF) 27" EPF SW, Arrangement-3
AIR FLOW : 14100 CFM RPM : 1616
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 15 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG75 η_{pt}: 73% η_t / η_{pt} : 95%

(F) FAN : (SF) 24" BAE DW, Arrangement-3
AIR FLOW : 14100 CFM RPM : 1461
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 15 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG85 η_{pt}: 82% η_t / η_{pt} : 99%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 27.75 X 152

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 46 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 470 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 6 @ 24 X 24 3 @ 24 X 12

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 71 X 41

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 38

(N) LOUVRE SIZE : 80 X 38
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

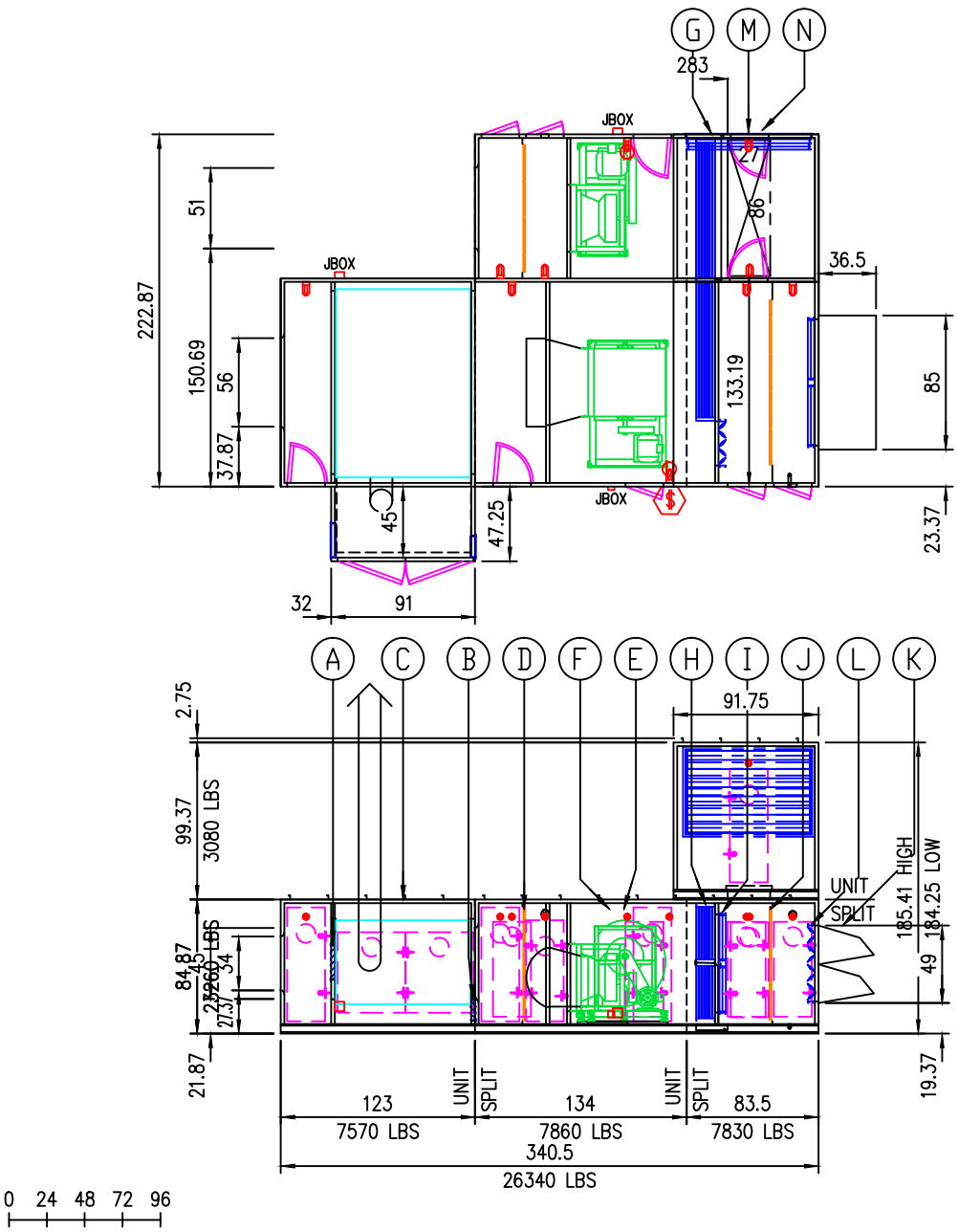
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U37SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-25	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 2500
FUEL PRESSURE: 0.500 psi
INPUT : 3000 MBH OUTPUT : 2400 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 471 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 3 @ 24 X 12 9 @ 24 X 24

(E) FAN : (RF) 30" EPF SW, Arrangement-3
AIR FLOW : 19800 CFM RPM : 1567
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 25 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG80 η_{pt}: 74% η_t / η_{pt} : 93%

(F) FAN : (SF) 30" BAE DW, Arrangement-3
AIR FLOW : 19800 CFM RPM : 1174
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 85% η_t / η_{pt} : 99%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 33.75 X 174

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 64 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 367 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 12 @ 24 X 24 3 @ 24 X 12

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 82 X 50

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 54

(N) LOUVRE SIZE : 80 X 54
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

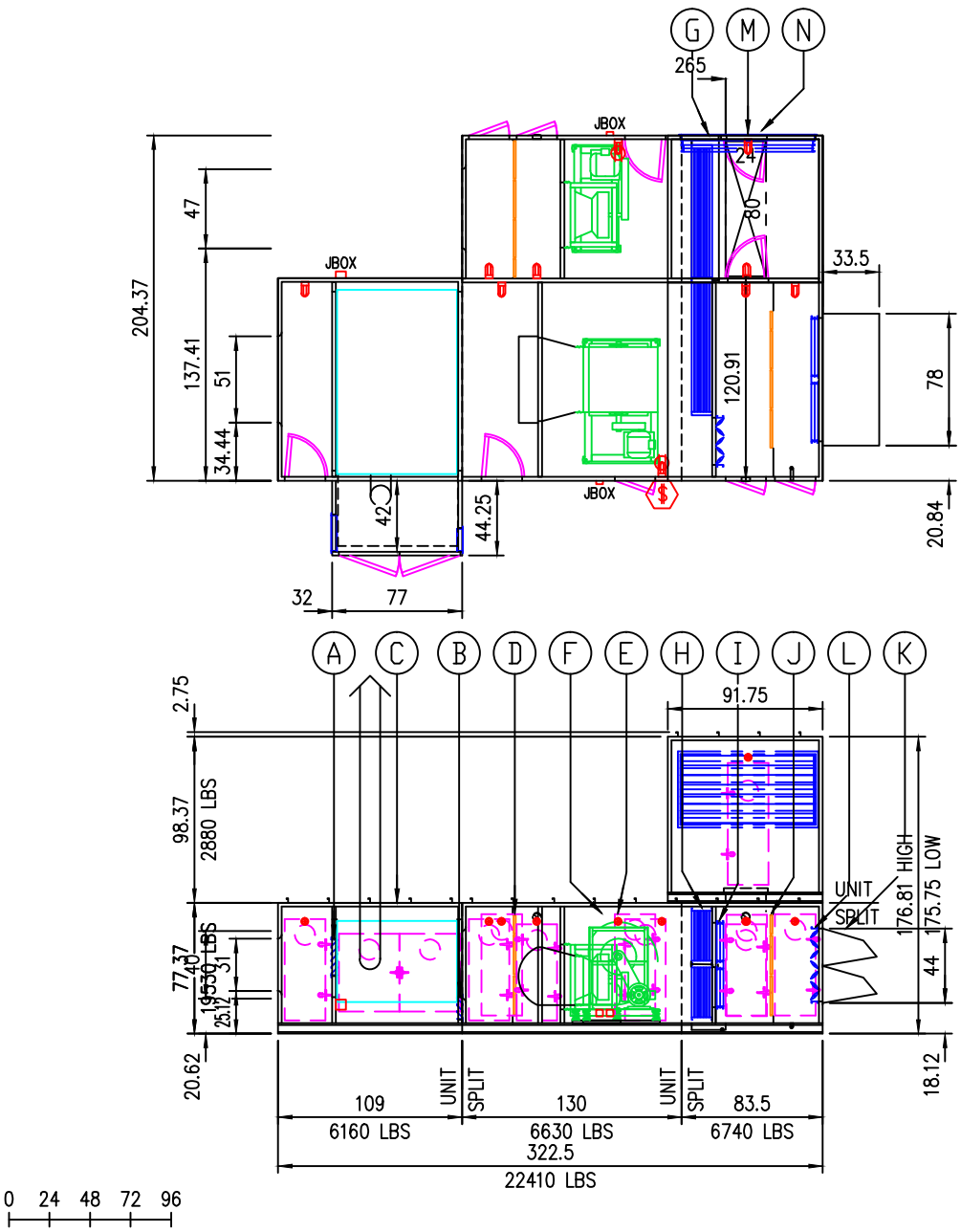
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U38SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-26	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 1750
FUEL PRESSURE: 0.500 psi
INPUT : 2250 MBH OUTPUT : 1800 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 476 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 5 @ 24 X 12 6 @ 24 X 24

(E) FAN : (RF) 27" EPQ SW, Arrangement-3
AIR FLOW : 16200 CFM RPM : 1779
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG75 η_{pt}: 72% η_t / η_{pt} : 89%

(F) FAN : (SF) 27" BAE DW, Arrangement-3
AIR FLOW : 16200 CFM RPM : 1309
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 15 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 85% η_t / η_{pt} : 99%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 30 X 156

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 52 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 476 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 6 @ 24 X 24 5 @ 24 X 12

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 75 X 45

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 42

(N) LOUVRE SIZE : 80 X 42
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

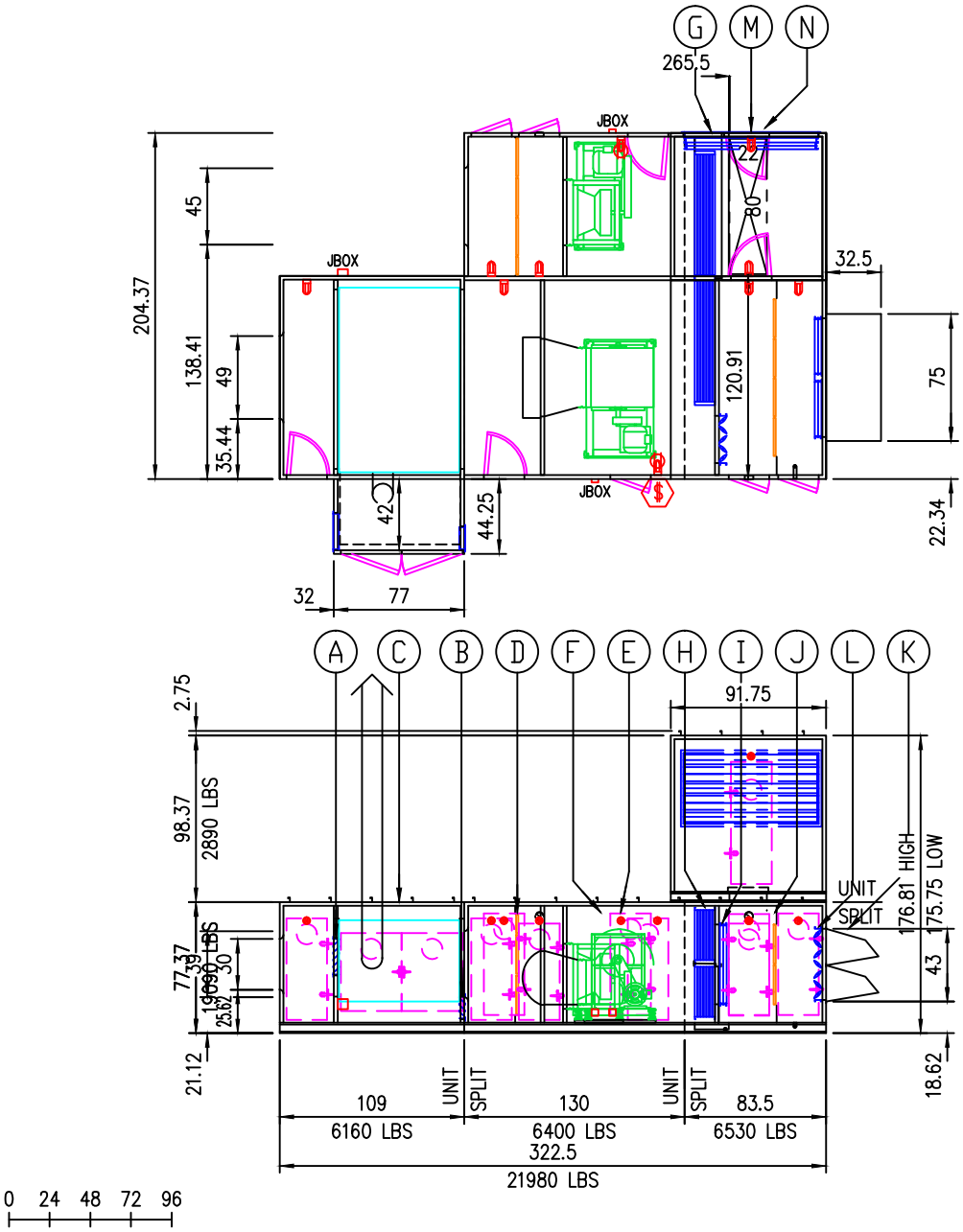
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U39SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-27	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 1750
FUEL PRESSURE: 0.500 psi
INPUT : 2250 MBH OUTPUT : 1800 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 447 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 5 @ 24 X 12 6 @ 24 X 24

(E) FAN : (RF) 27" EPF SW, Arrangement-3
AIR FLOW : 15200 CFM RPM : 1691
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG75 η_{pt}: 73% η_t / η_{pt} : 93%

(F) FAN : (SF) 24" BAE DW, Arrangement-3
AIR FLOW : 15200 CFM RPM : 1508
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 15 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG85 η_{pt}: 82% η_t / η_{pt} : 98%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 30 X 146

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 49 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 475 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 8 @ 24 X 24

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 72 X 44

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 42

(N) LOUVRE SIZE : 80 X 42
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

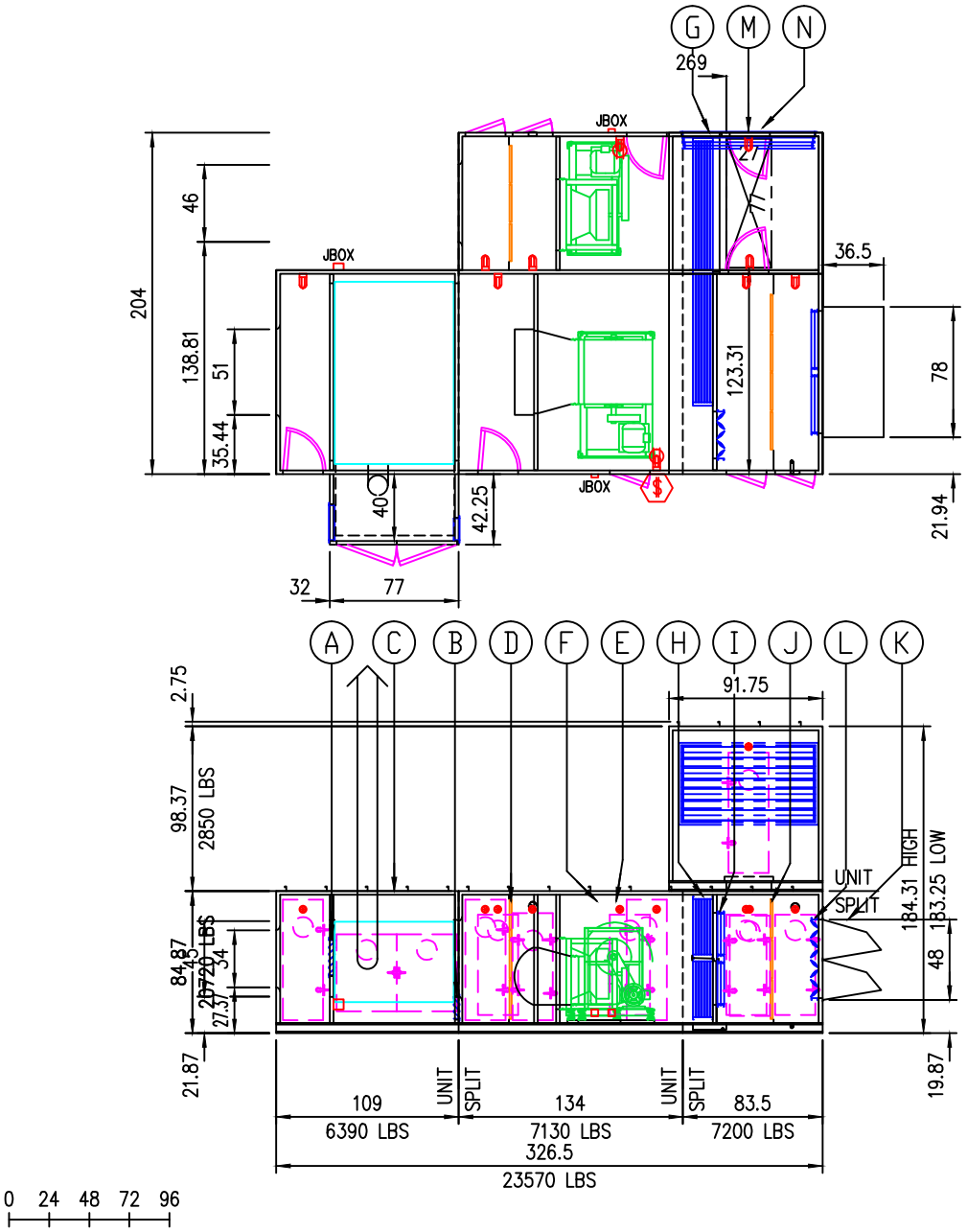
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U40SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-28	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

A LOUVRE SIZE : 22 X 22
Std Louvre

B LOUVRE SIZE : 14 X 14
Std Louvre

C GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 1750
FUEL PRESSURE: 0.500 psi
INPUT : 2250 MBH OUTPUT : 1800 MBH

D FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 494 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 9 @ 24 X 24

E FAN : (RF) 30" EPF SW, Arrangement-3
AIR FLOW : 17800 CFM RPM : 1470
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG80 η_{pt}: 74% η_t / η_{pt} : 96%

F FAN : (SF) 27" BAE DW, Arrangement-3
AIR FLOW : 17800 CFM RPM : 1362
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 85% η_t / η_{pt} : 98%

G DRAIN PAN

H HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 33.75 X 156

I OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 57 X 30

J FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 371 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 12 @ 24 X 24

K OA HOOD
TYPICAL OF 2

L OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 75 X 49

M EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 46

N LOUVRE SIZE : 80 X 46
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

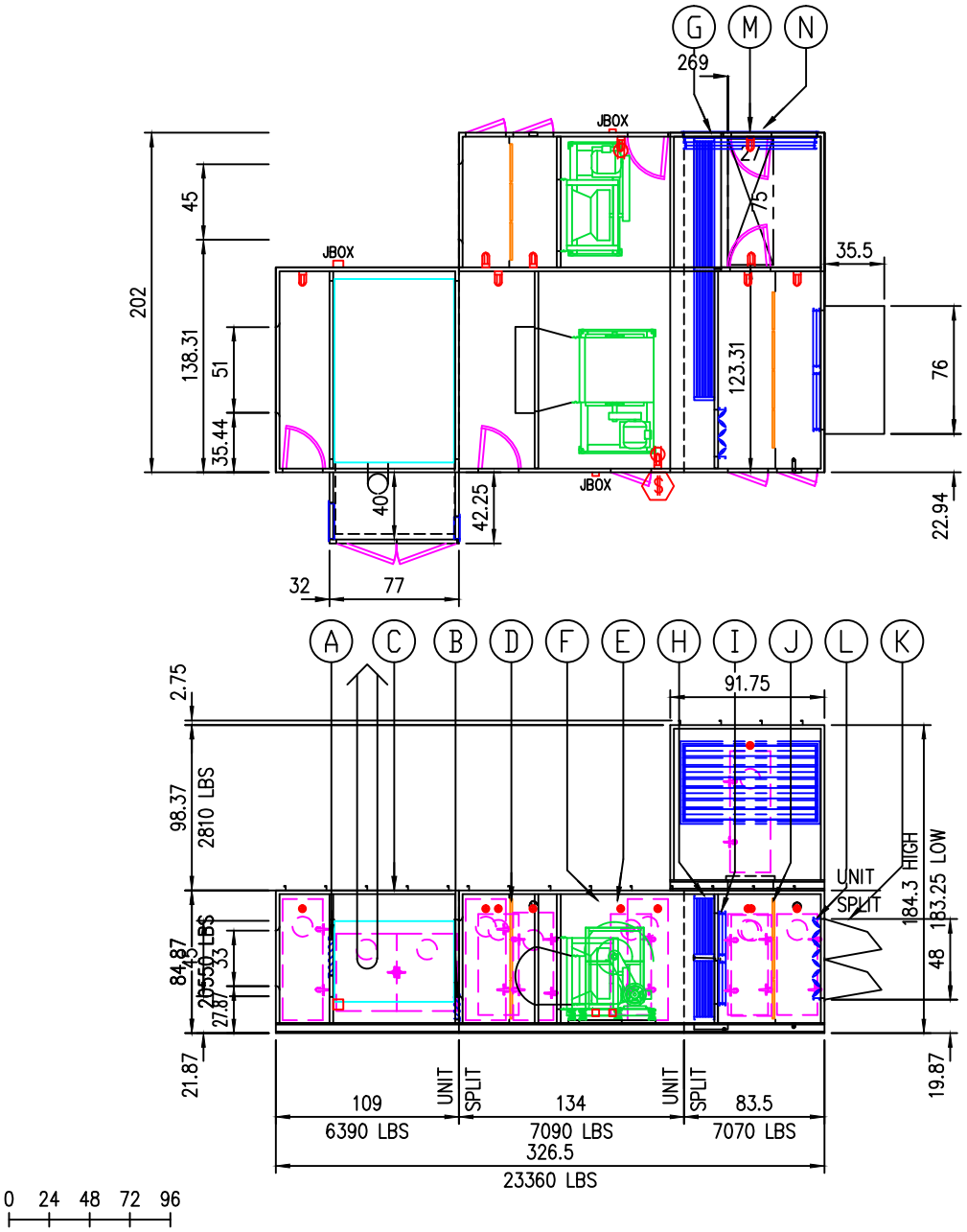
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U41SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-29,30	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 1750
FUEL PRESSURE: 0.500 psi
INPUT : 2250 MBH OUTPUT : 1800 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 478 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 9 @ 24 X 24

(E) FAN : (RF) 30" EPF SW, Arrangement-3
AIR FLOW : 17200 CFM RPM : 1442
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 20 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG80 η_{pt}: 74% η_t / η_{pt} : 96%

(F) FAN : (SF) 27" BAE DW, Arrangement-3
AIR FLOW : 17200 CFM RPM : 1342
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 15 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 85% η_t / η_{pt} : 98%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 2 @ 33.75 X 152

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 56 X 30

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 358 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 12 @ 24 X 24

(K) OA HOOD
TYPICAL OF 2

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 73 X 49

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 46

(N) LOUVRE SIZE : 80 X 46
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

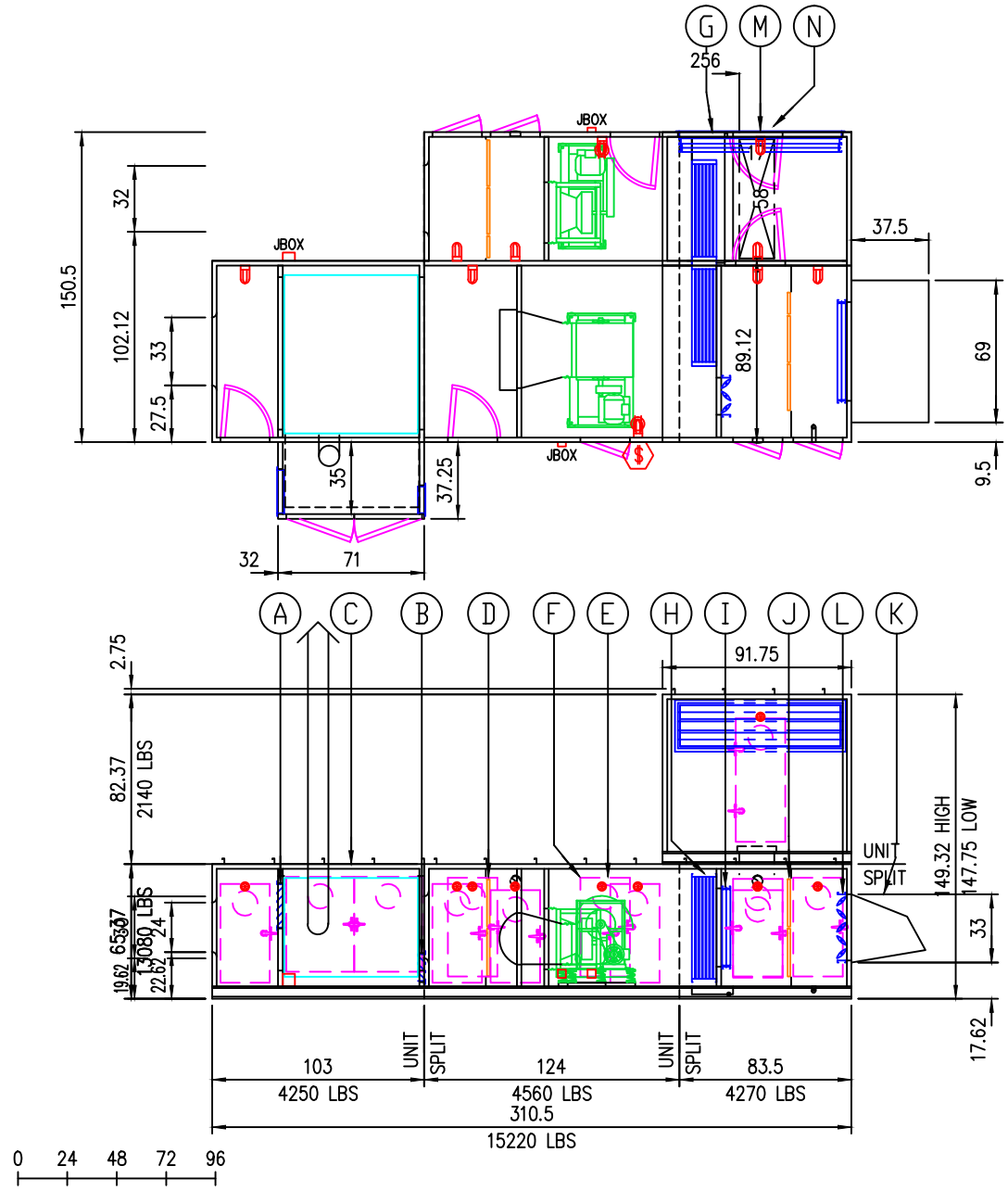
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U42SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-31	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

(A) LOUVRE SIZE : 22 X 22
Std Louvre

(B) LOUVRE SIZE : 14 X 14
Std Louvre

(C) GAS FIRED FURNACE, 20:1 TURNDOWN
MAKE : HC MODEL : HE 1000
FUEL PRESSURE: 0.500 psi
INPUT : 1250 MBH OUTPUT : 1000 MBH

(D) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 410 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 2 @ 24 X 12 4 @ 24 X 24

(E) FAN : (RF) 20" EPF SW, Arrangement-3
AIR FLOW : 8200 CFM RPM : 2282
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 10 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG75 η_{pt}: 70% η_t / η_{pt} : 93%

(F) FAN : (SF) 18" BAE DW, Arrangement-3
AIR FLOW : 8200 CFM RPM : 2007
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 10 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 80% η_t / η_{pt} : 97%

(G) DRAIN PAN

(H) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 1 @ 50 X 96

(I) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 40 X 20

(J) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 410 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 4 @ 24 X 24 2 @ 24 X 12

(K) OA HOOD

(L) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 50 X 34

(M) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 22

(N) LOUVRE SIZE : 80 X 22
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

SDG VER: Jun 20 2014

PROJECT

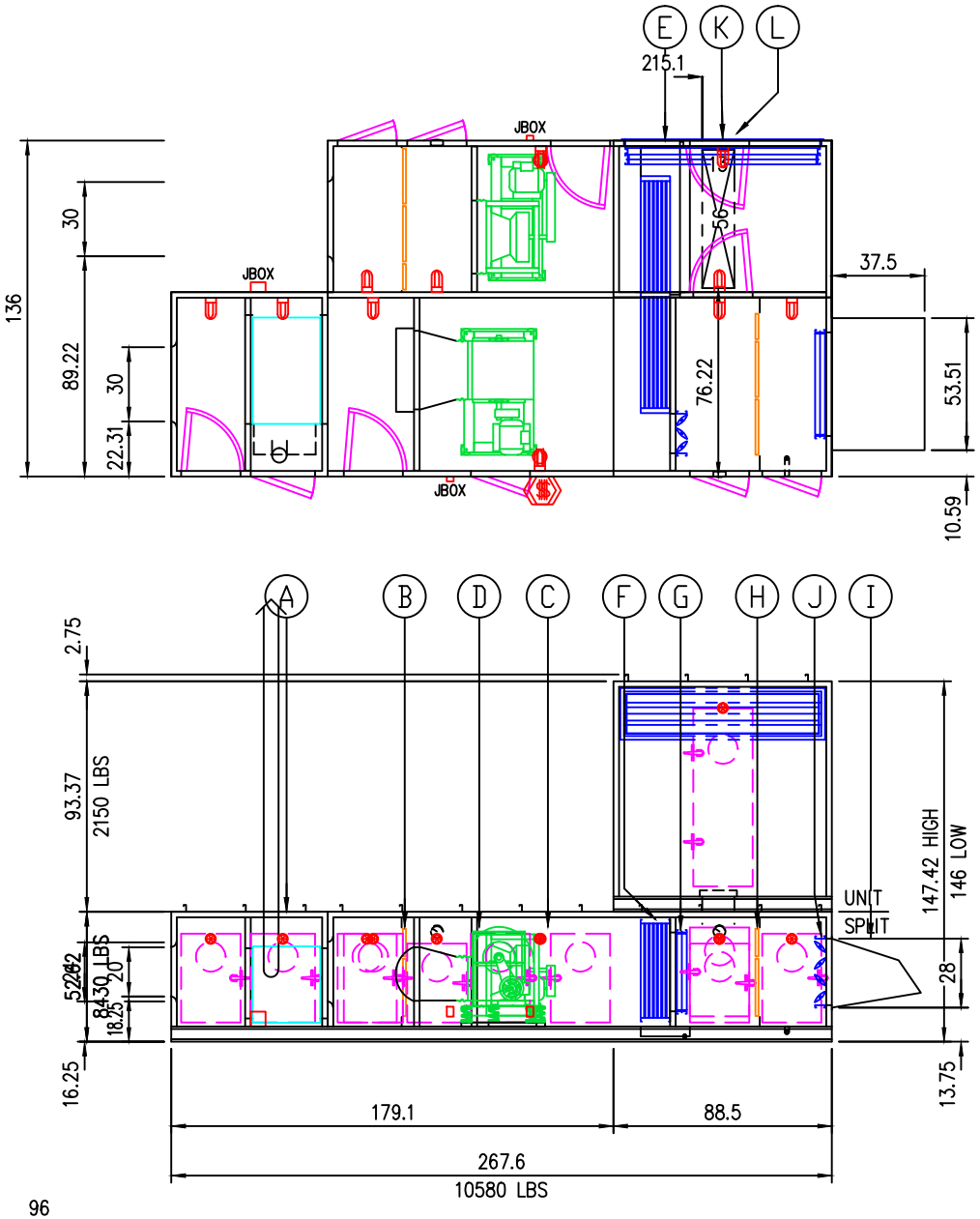
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U43SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-32	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



(A) GAS FIRED FURNACE, 5:1 TURNDOWN
MAKE : Heatco HM MODEL :HMA 400
FUEL PRESSURE: 0.500 psi
INPUT : 400 MBH OUTPUT : 320 MBH

(B) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 443 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 3 @ 24 X 12 2 @ 24 X 24

(C) FAN : (RF) 20" EPF SW, Arrangement-3
AIR FLOW : 6200 CFM RPM : 1962
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 7.5 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG75 η_{pt}: 70% η_t / η_{pt} : 99%

(D) FAN : (SF) 16" BAE DW, Arrangement-3
AIR FLOW : 6200 CFM RPM : 2346
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 7.5 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG75 η_{pt}: 70% η_t / η_{pt} : 99%

(E) DRAIN PAN

(F) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 1 @ 38.75 X 92

(G) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 34 X 18

(H) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 443 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 2 @ 24 X 24 3 @ 24 X 12

(I) OA HOOD

(J) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 44 X 29

(K) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 18

(L) LOUVRE SIZE : 80 X 18
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

SDG VER: Jun 20 2014

PROJECT

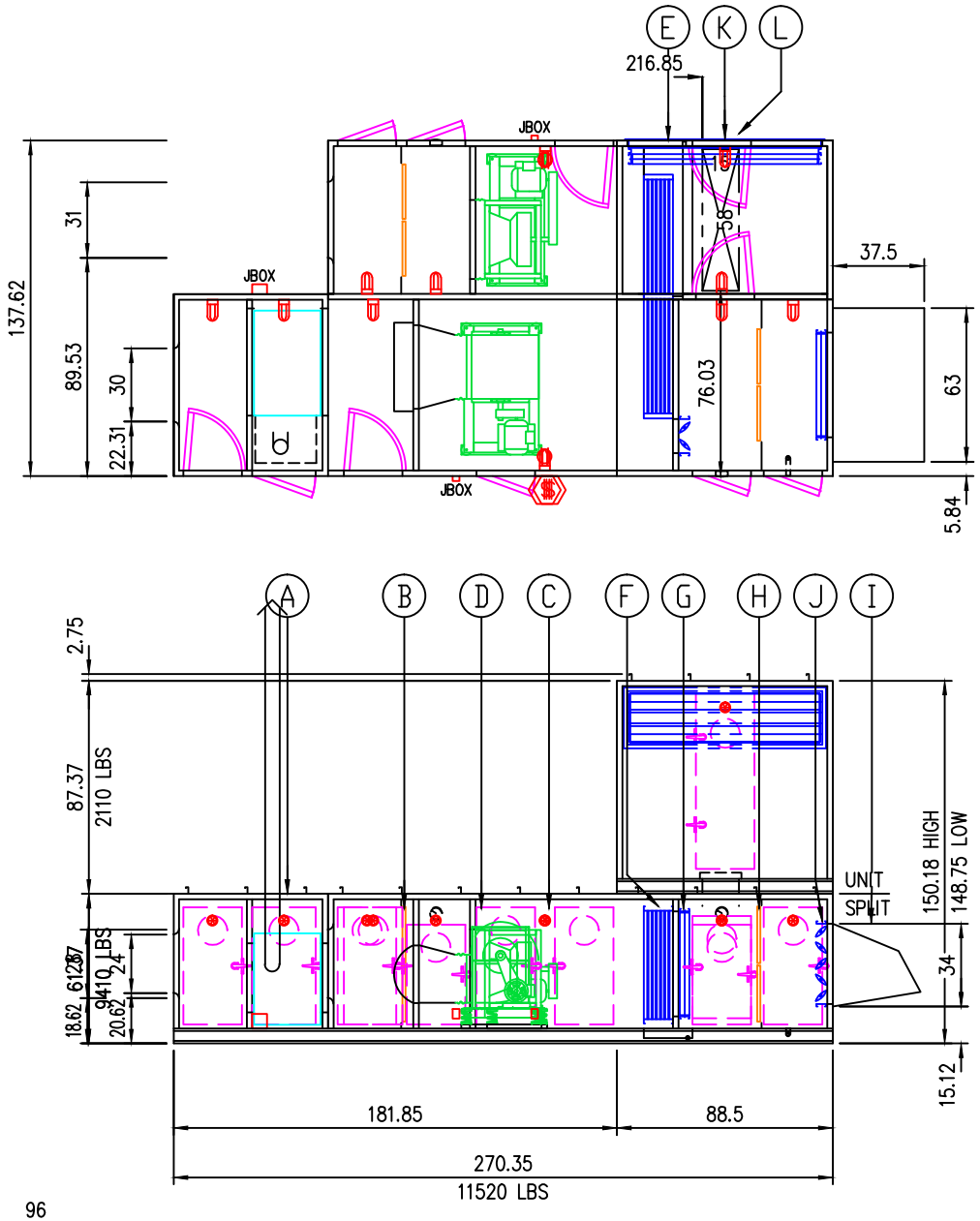
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U44SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-33	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



(A) GAS FIRED FURNACE, 5:1 TURNDOWN
MAKE : Heatco HM ~~MODEL~~ :HMA 500
FUEL PRESSURE: 0.500 psi
INPUT : 500 MBH OUTPUT : 400 MBH

(B) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 469 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 4 @ 24 X 24

(C) FAN : (RF) 22" EPF SW, Arrangement-3
AIR FLOW : 7500 CFM RPM : 1709
T.S.P. : 3.5 in wc CLASS : II
MOTOR : 7.5 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG75 η_{pt}: 73% η_t / η_{pt} : 99%

(D) FAN : (SF) 18" BAE DW, Arrangement-3
AIR FLOW : 7500 CFM RPM : 1935
T.S.P. : 3.75 in wc CLASS : II
MOTOR : 7.5 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG90 η_{pt}: 80% η_t / η_{pt} : 99%

(E) DRAIN PAN

(F) HEAT PIPE
TYPE : Heat Pipe Technology, 6 ROW
SIZES : 1 @ 45 X 96

(G) OA BYPASS DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 45 X 16

(H) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 469 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 4 @ 24 X 24

(I) OA HOOD

(J) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 45 X 35

(K) EA LV DAMPER : PARALLEL BLADES
MAKE : T.A. Morrison 1000
SIZE : 80 X 22

(L) LOUVRE SIZE : 80 X 22
Std Louvre

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

SDG VER: Jun 20 2014

PROJECT

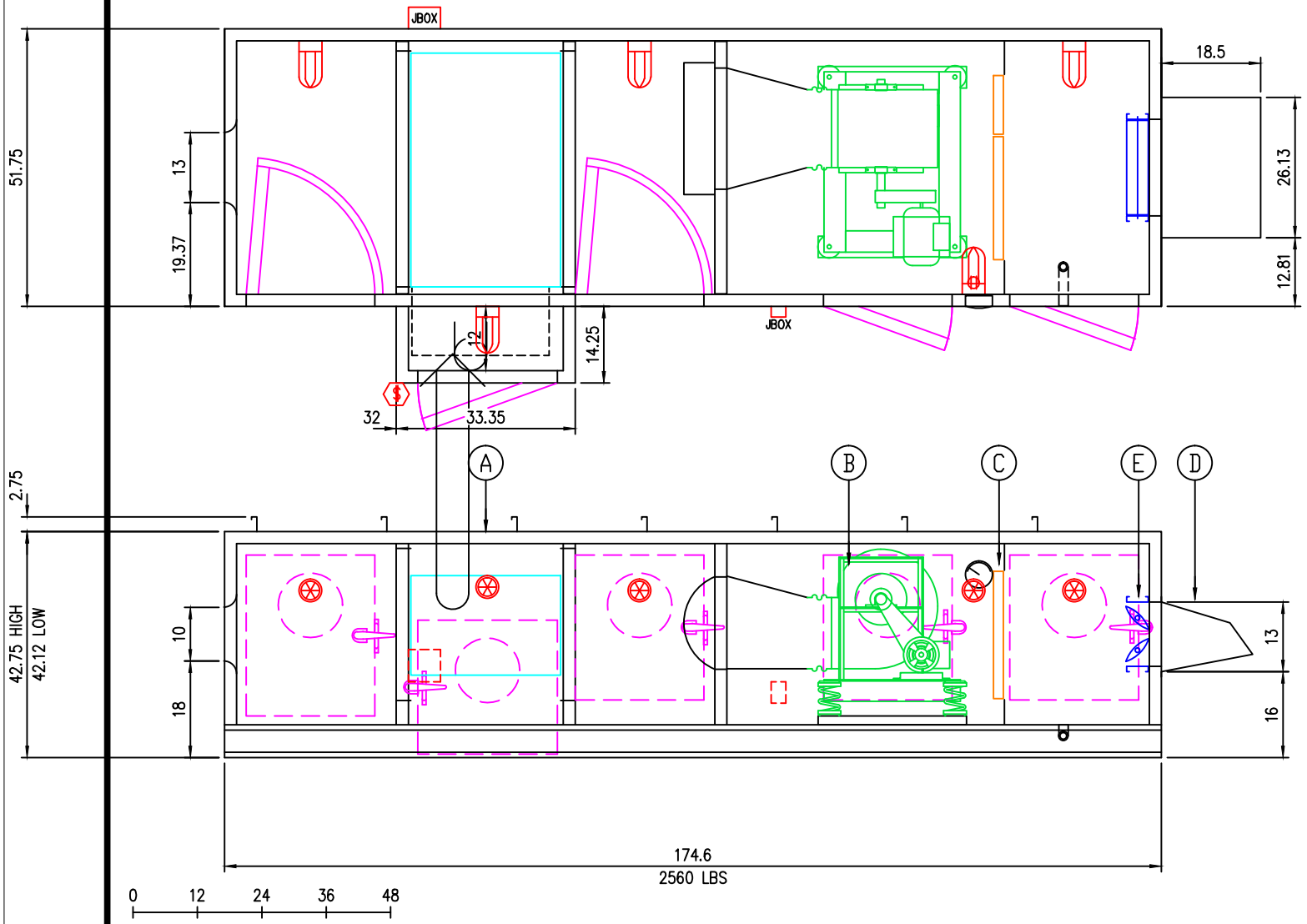
MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U45SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-34	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8



(A) GAS FIRED FURNACE, 4:1 TURNDOWN
MAKE : Heatco HM MODEL : HMA 150
FUEL PRESSURE: 0.500 psi
INPUT : 150 MBH OUTPUT : 120 MBH

(B) FAN : (SF) 12" BAE DW, 50% Width, Arrangement-3
AIR FLOW : 1300 CFM RPM : 2607
T.S.P. : 2.5 in wc CLASS : II
MOTOR : 1 HP, ODP Prem-Eff, 460/3/60
RPM : 1750 (GROUNDED SHAFT)
ISOLATORS : OS DEF : 2 in
FEG85 η_{pt}: 71% η_t / η_{pt} : 97%

(C) FILTERS : LIFT-OUT UPSTREAM
VELOCITY : 217 FPM
TYPE : 2" (MERV 8) Farr 30/30
SIZES : 1 @ 24 X 24 1 @ 24 X 12

(D) OA HOOD

(E) OA DAMPER : OPPOSED BLADES
MAKE : T.A. Morrison 1000
SIZE : 20 X 14

UNIT MOUNTING
The unit is designed to be mounted on a roof curb.

Note : Calculated unit weights are shipping weights and do not reflect operating conditions, items which are field installed or ship loose.

SDG VER: Jun 20 2014

PROJECT MBG - TORONTO TRANSIT CENTER

OPENINGS AND DIMENSIONS MAY VARY FROM CONTRACT DOCUMENTS. RETURN OF APPROVED DRAWINGS CONSTITUTES ACCEPTANCE OF THESE VARIANCES.

JOB NO.	49446	DRAWN BY	TN	DWG NO.	49446U46SD01	ACCESS SIDE	RIGHT	DWG UNITS	IN
TAG	AHU-35	DATE	JUN 26/14	TYPE	OUTDOOR	10:00		SCALE	N.T.S.

SALES OFFICE	TRANE VANCOUVER
SALES ENGINEER	IVAN HOLDO

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8

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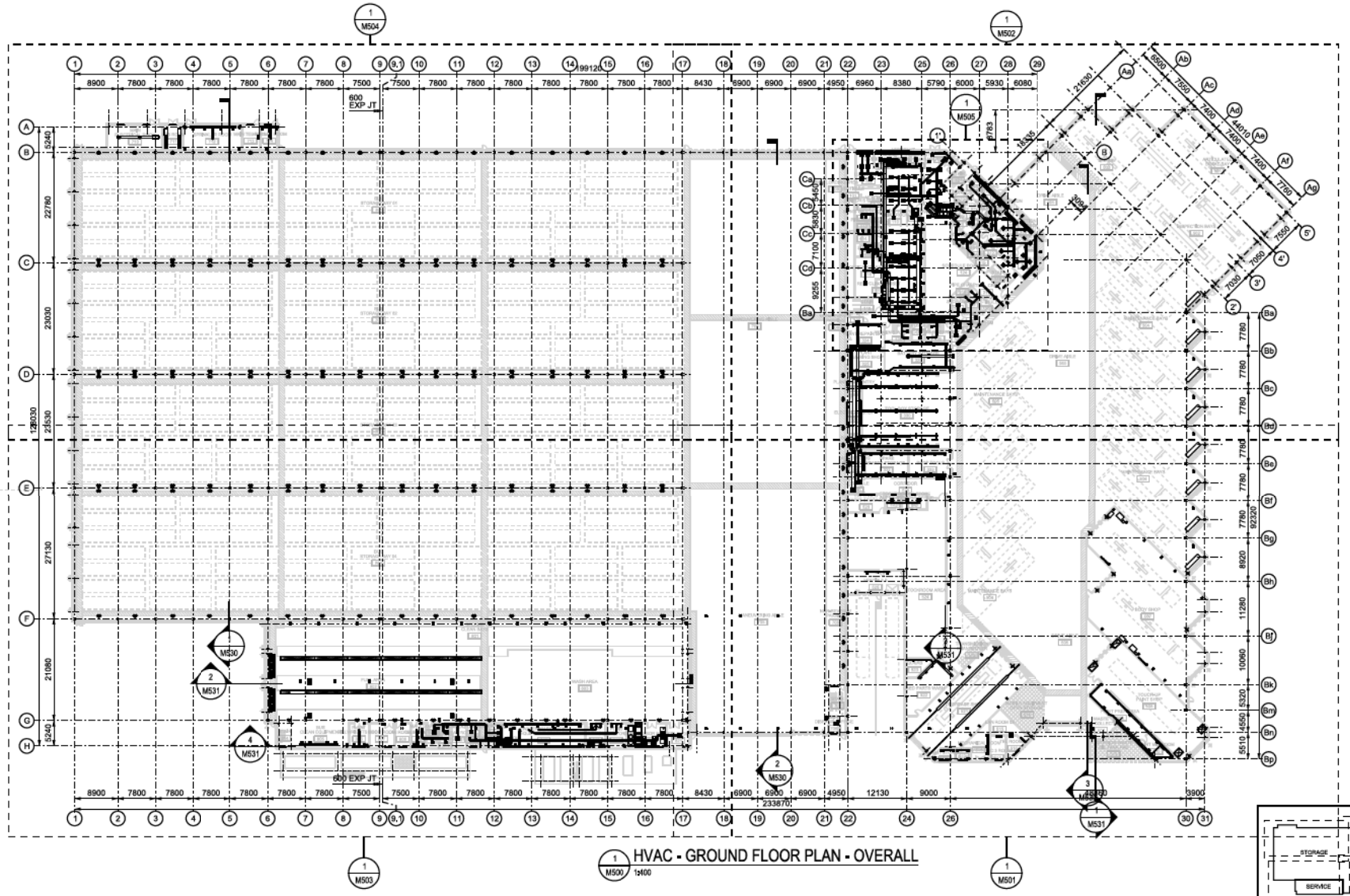


1 M500 HVAC - GROUND FLOOR PLAN - OVERALL 1x100

BLDG. REF. No.

FILE: STN_81a_hv_pln_01.dgn

SHEET No.

DRAWING No.: G85-314-M500

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S) 0 2 4 6 8 10 15m

Stantec HDR

DESIGNED	V. JOSHI	2014/05/15
DRAWN	S. CHUNG	2014/05/15
CHECKED	P. MARSH	2014/06/13
APPROVED		

McNICOLL BUS GARAGE

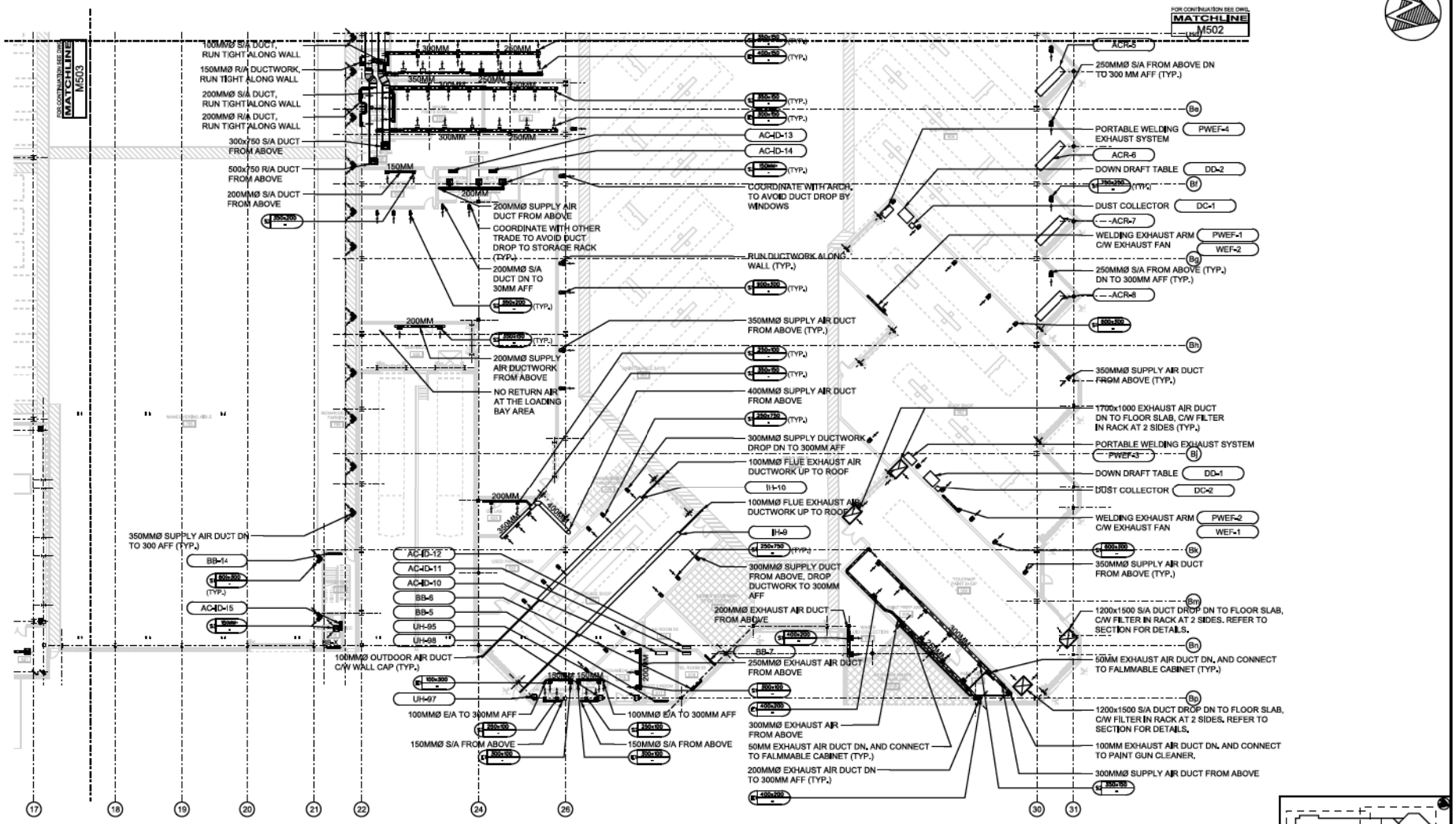
H.V.A.C
GROUND FLOOR PLAN
OVERALL

Plot Date: 08-24-2014

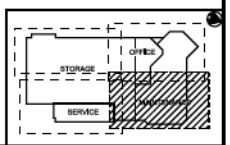
Dwg. No. G85-314-M500

Sheet No.

CADD FILE NAME: pw:\PWAPPPITT012.NorthEast_Pittsburgh\Documents\Toronto_Transit_Commission\KF_McNicoll_Bus_Garage\13.00_CAD\13.02_Contract_Files\CAD_BIM\14_Mech\Sheets\HVAC Sheet - M501 - Ground Floor Plan - North East



1 M501 HVAC - GROUND FLOOR PLAN - NORTH EAST
1200



REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S)

Stantec HDR

DESIGNED	V. JOSHI	2014/05/15
DRAWN	S. CHUNG	2014/05/15
CHECKED	P. MARSH	2014/06/13
APPROVED		

McNICOLL BUS GARAGE

H.V.A.C
GROUND FLOOR PLAN
NORTH EAST

Plot Date: 08-24-2014

Dwg. No. G85-314-M501

Sheet No.

BLDG. REF. No.
FILE: STN_81a_hv_plh_01_redign
SHEET No.
DRAWING No. G85-314-M501

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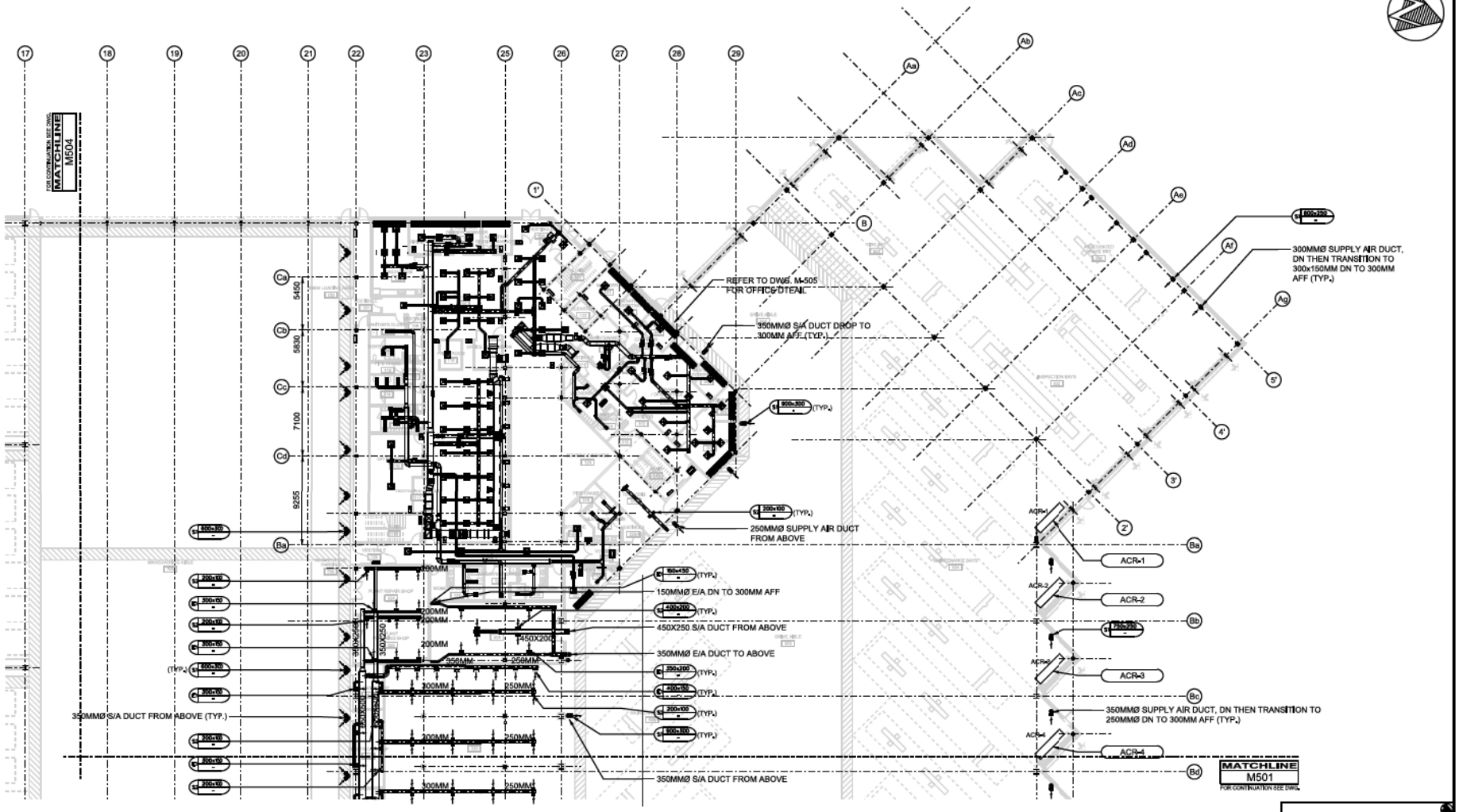
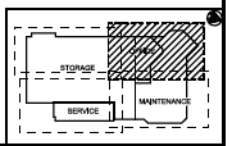


1 M502 HVAC - GROUND FLOOR PLAN - NORTH WEST 1:200



REVISIONS	REVISIONS						
		SCOPE REVIEW DRAWING NOT FOR CONSTRUCTION	Stantec HDR			DESIGNED V. JOSHI 2014/05/15 DRAWN S. CHUNG 2014/05/15 CHECKED P. MARSH 2014/05/13 APPROVED	McNICOLL BUS GARAGE H.V.A.C GROUND FLOOR PLAN NORTH WEST

SCALE(S) 0 1 2 3 4 5 m

Plot Date: 08-24-2014

Dwg. No. G85-314-M502

Sheet No.

DRAWING No.: G85-314-M502 SHEET No.: FILE: STN_81a_hv_pln_01_nw.dgn BLDG. REF. No.

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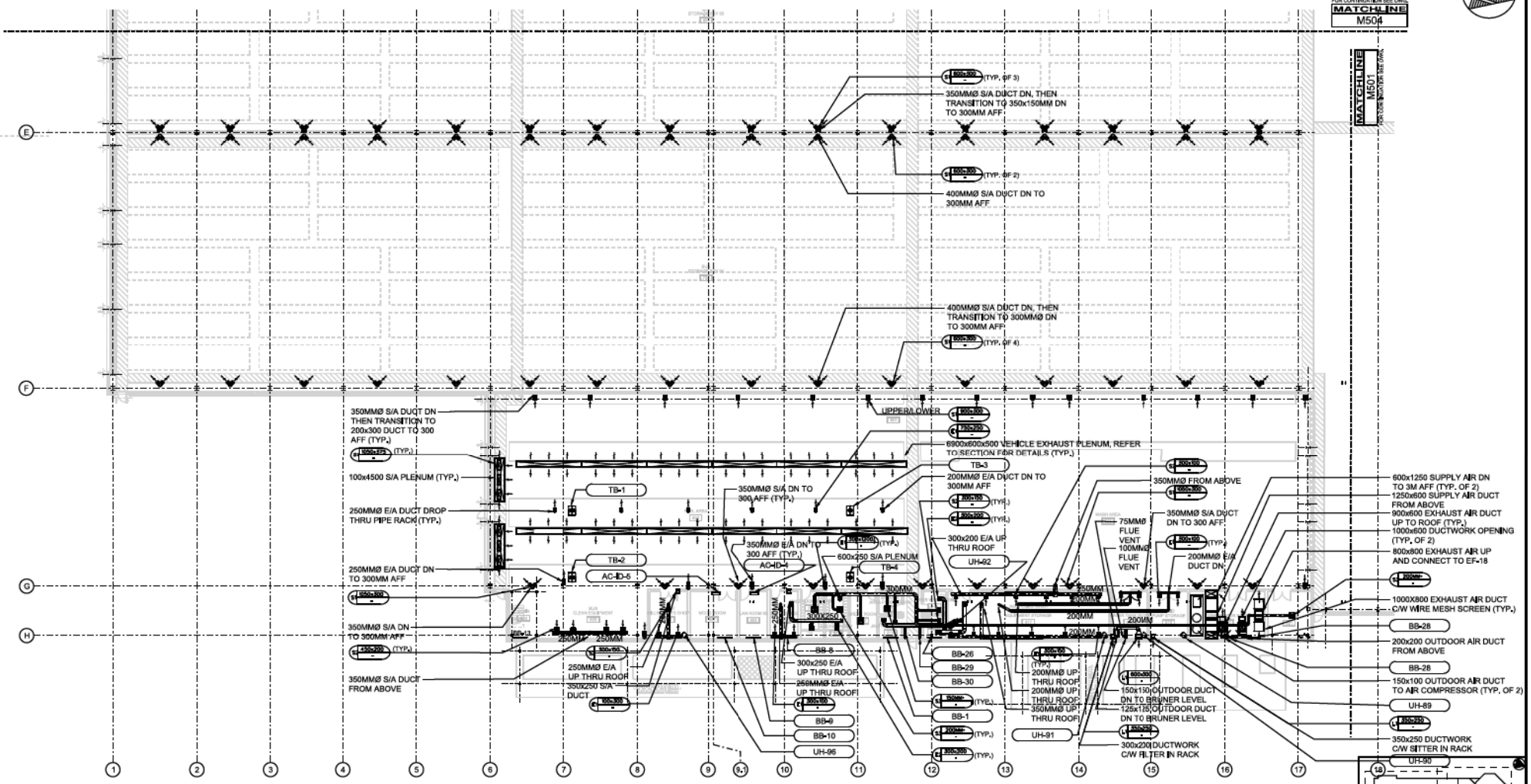

1 M503 HVAC - GROUND FLOOR PLAN - SOUTH EAST
1:200

BLDG. REF. No.
FILE: STN_81a_hv_gfp_01_se.dgn
SHEET No.
DRAWING No. G85-314-M503

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S) 0 1 2 3 4 5 6m

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
APPROVED

McNICOLL BUS GARAGE

H.V.A.C
GROUND FLOOR PLAN
SOUTH EAST

Plot Date: 08-24-2014

Dwg. No. G85-314-M503

Sheet No.

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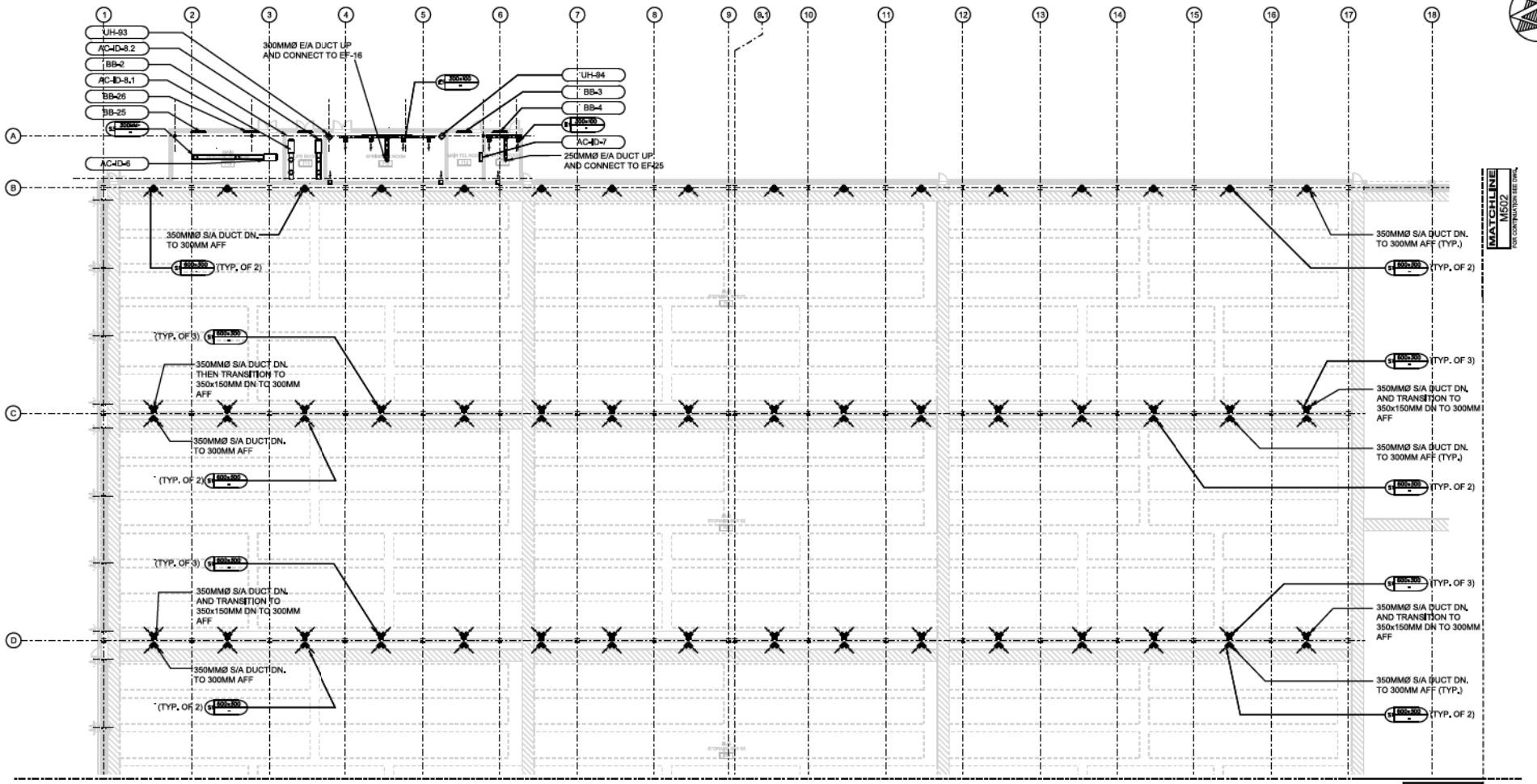
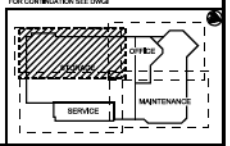


1 / M504 HVAC - GROUND FLOOR PLAN - SOUTH WEST
1:200



REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S) 0 1 2 3 4 5 6m

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
APPROVED

McNICOLL BUS GARAGE

H.V.A.C
GROUND FLOOR PLAN
SOUTH WEST

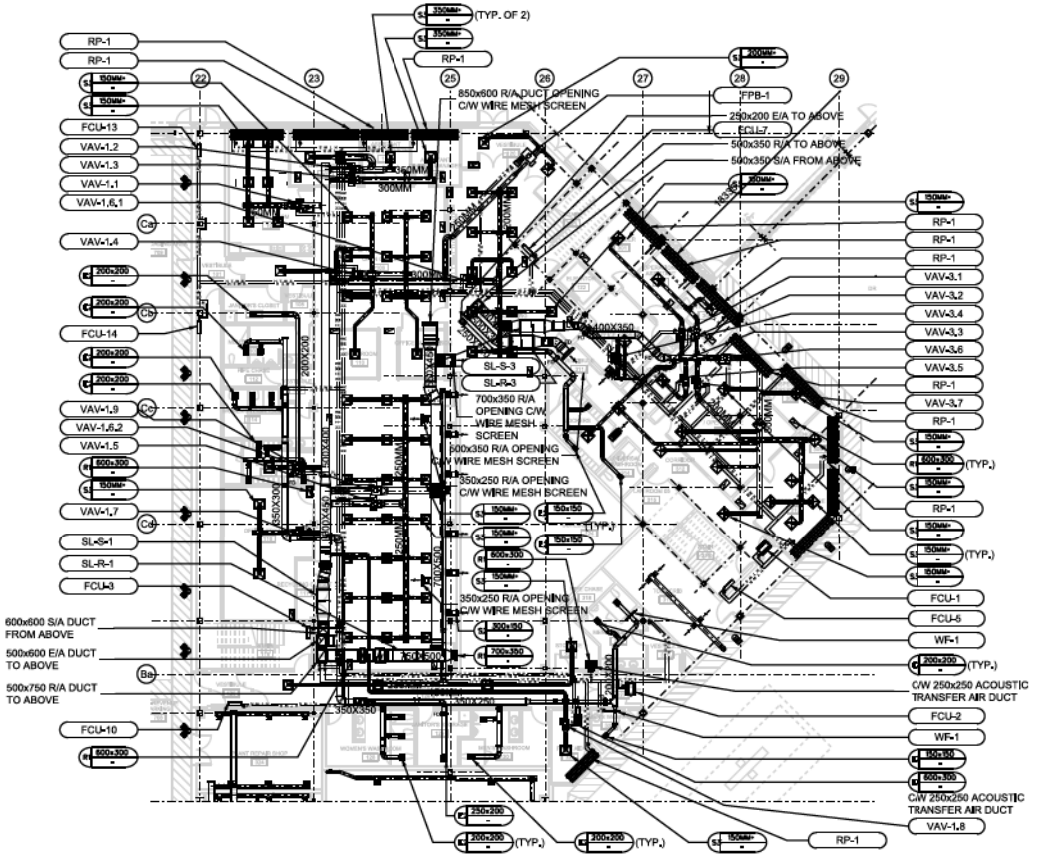
Plot Date: 08-24-2014

Dwg. No. G85-314-M504

Sheet No.

DRAWING No.: G85-314-M504 SHEET No. FILE: STN_81a_hv_gfp_01_sw.dgn BLDG. REF. No.

CADD FILE NAME: pw:\\PWAPPPITT012.NorthEast_Pittsburgh\Documents\Toronto_Transit_Commission\KF_McNicoll_Bus_Garage\13.00_CAD\13.02_Contract_Files\CAD_BIM\14_Mech\Sheets\HVAC Sheet - M505 - Ground Floor Plan - Office Enlarge



1 M505 HVAC - GROUND FLOOR PLAN - ENLARGE OFFICE
1:150

BLDG. REF. No.
FILE: STN_81a_hv_pln_01_ref.dgn
SHEET No.
DRAWING No.: G85-314-M505

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S)

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
APPROVED

McNICOLL BUS GARAGE

H.V.A.C
GROUND FLOOR PLAN
OFFICE ENLARGE

Plot Date: 06-26-2014

Dwg. No. G85-314-M505

Sheet No.

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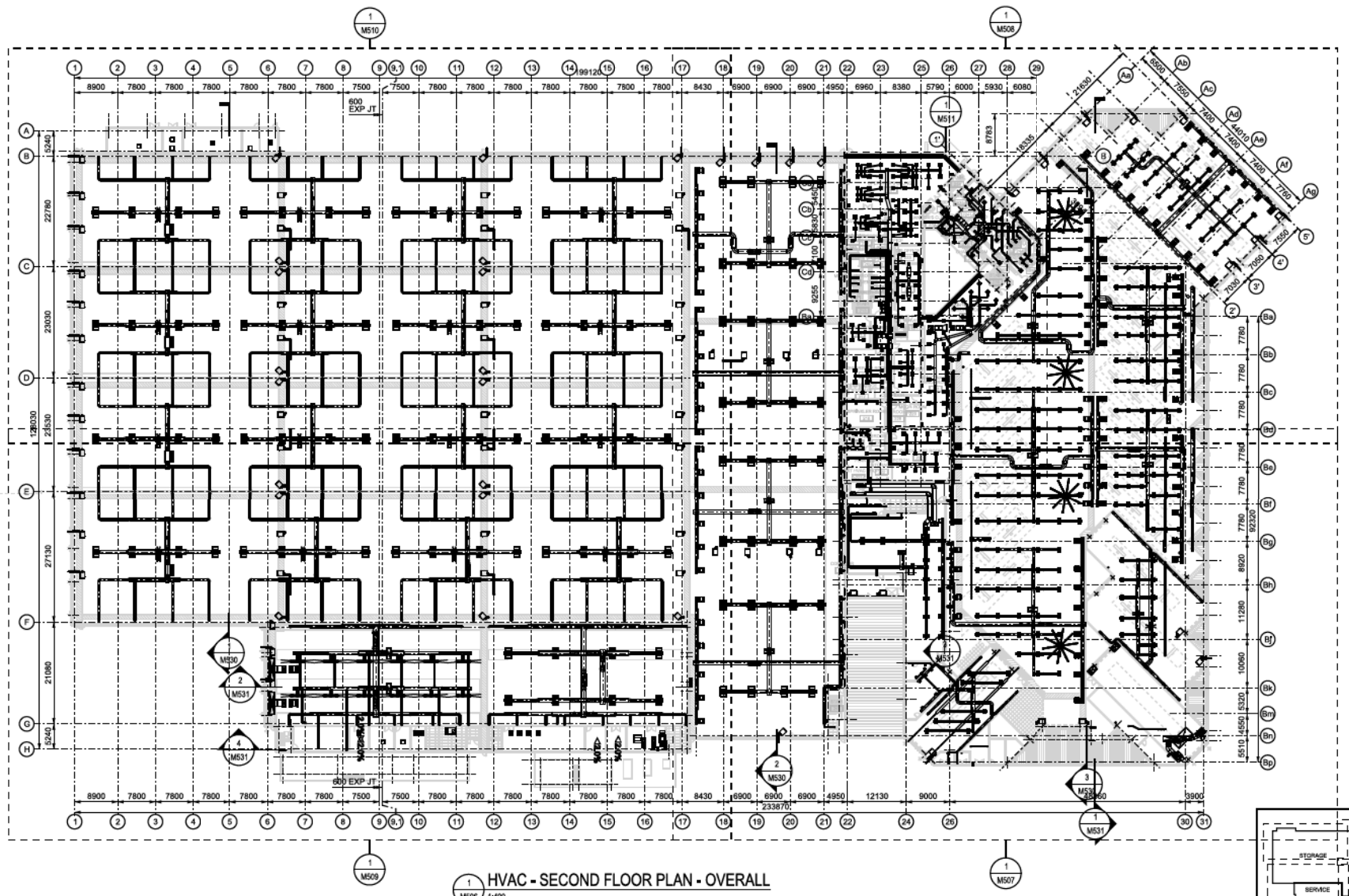


1 M506 HVAC - SECOND FLOOR PLAN - OVERALL
1:400

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S)

Stantec HDR

DESIGNED	V. JOSHI	2014/05/15
DRAWN	S. CHUNG	2014/05/15
CHECKED	P. MARSH	2014/06/13
APPROVED		

McNICOLL BUS GARAGE

H.V.A.C
SECOND FLOOR PLAN
OVERALL

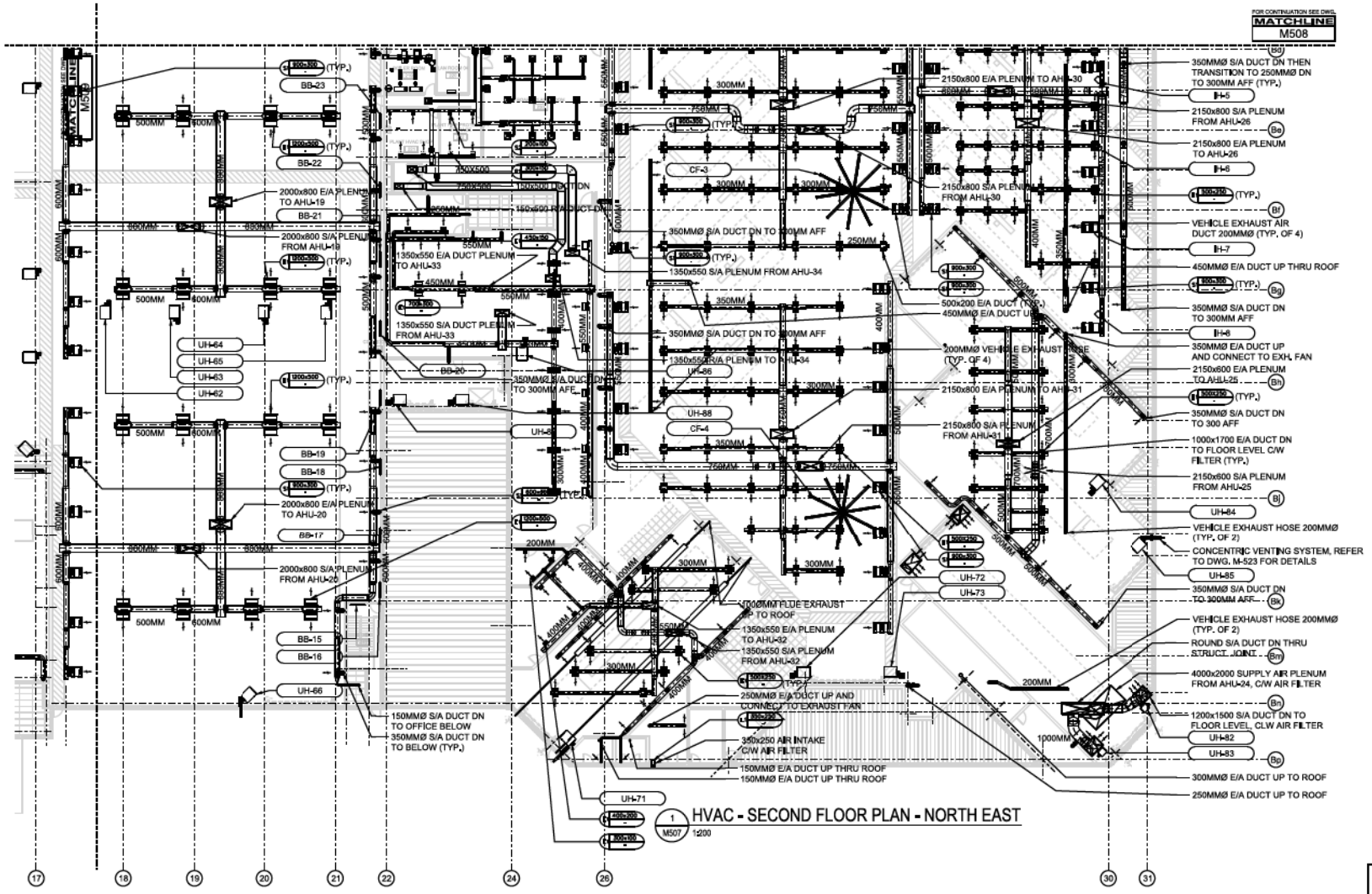
Plot Date: 08-25-2014

Dwg. No. G85-314-M506

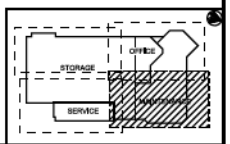
Sheet No.

BLDG. REF. No.
FILE: STN_81a_hv_pln_02.dgn
SHEET No.
DRAWING No.: G85-314-M506

CADD FILE NAME: pw:\PWAPPPITT012.NorthEast_Pittsburgh\Documents\Toronto_Transit_Commission\KF_McNicoll_Bus_Garage\13.00_CAD\13.02_Contract_Files\CAD_BIM\14_Mech\Sheets\HVAC Sheet - M507 - Second Floor Plan - North East



1 M507 HVAC - SECOND FLOOR PLAN - NORTH EAST 1:200



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FILE: STN_81s_hv_pln_02_redsgn
SHEET No.
DRAWING No.: G85-314-M507

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S) 0 1 2 3 4 5 m

Stantec HDR

DESIGNED	V. JOSHI	2014/05/15
DRAWN	S. CHUNG	2014/05/15
CHECKED	P. MARSH	2014/06/13
APPROVED		

McNICOLL BUS GARAGE

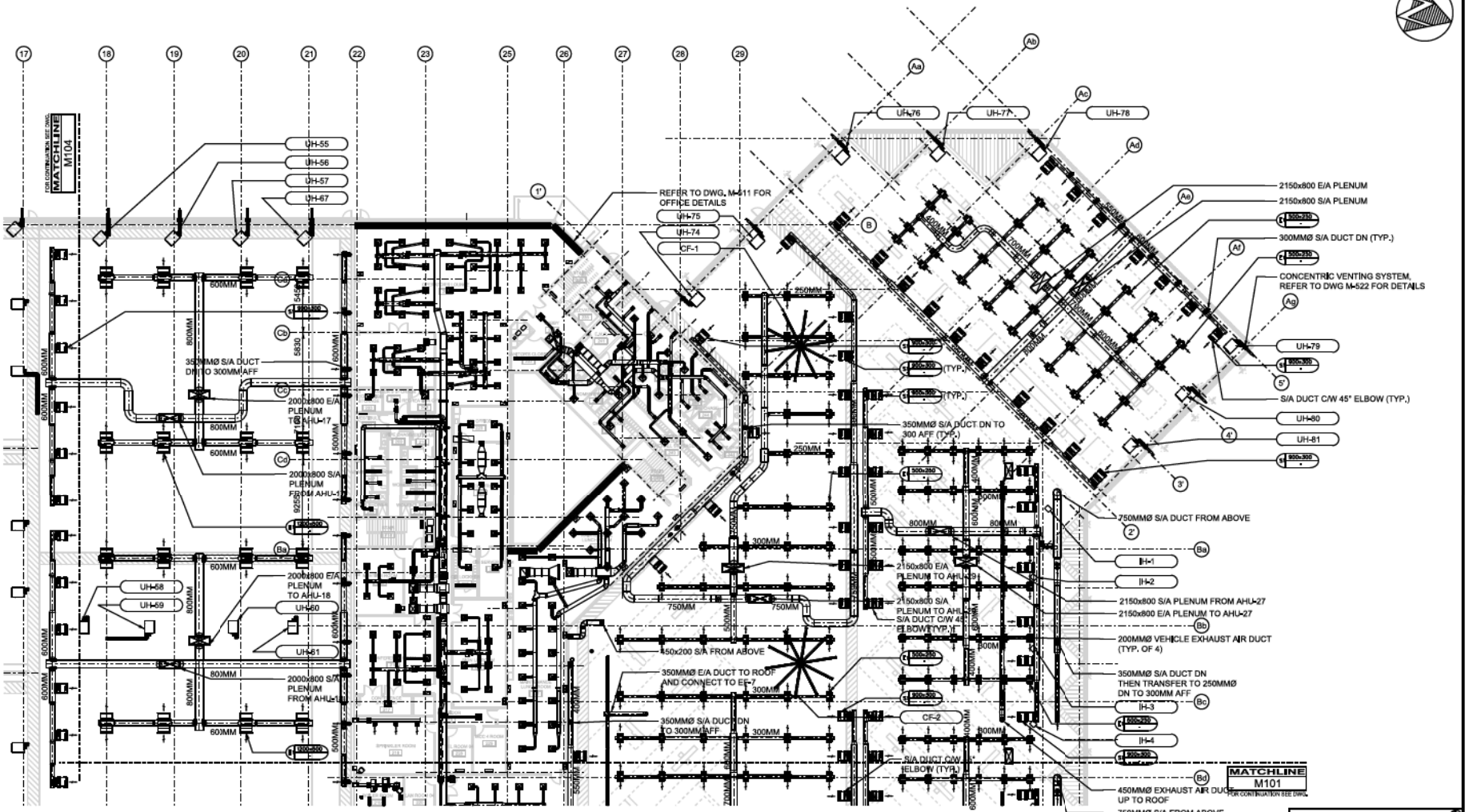
H.V.A.C
SECOND FLOOR PLAN
NORTH EAST

Plot Date: 08-24-2014

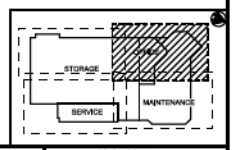
Dwg. No. G85-314-M507

Sheet No.

CADD FILE NAME: pw:\PWAPPPITT012.NorthEast_Pittsburgh\Documents\Toronto_Transit_Commission\KF_McNicoll_Bus_Garage\13.00_CAD\13.02_Contract_Files\CAD_BIM\14_Mech\Sheets\HVAC Sheet - M508 - Second Floor Plan - North West



1 / M508 HVAC - SECOND FLOOR PLAN - NORTH WEST
1:200



REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S) 0 1 2 3 4 5 m

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/05/13
APPROVED

McNICOLL BUS GARAGE

H.V.A.C
SECOND FLOOR PLAN
NORTH WEST

Plot Date: 08-24-2014

Dwg. No. G85-314-M508

Sheet No.

DRAWING No.: G85-314-M508 SHEET No. FILE: STN_81a_hv_pln_02_nw.dgn BLDG. REF. No.

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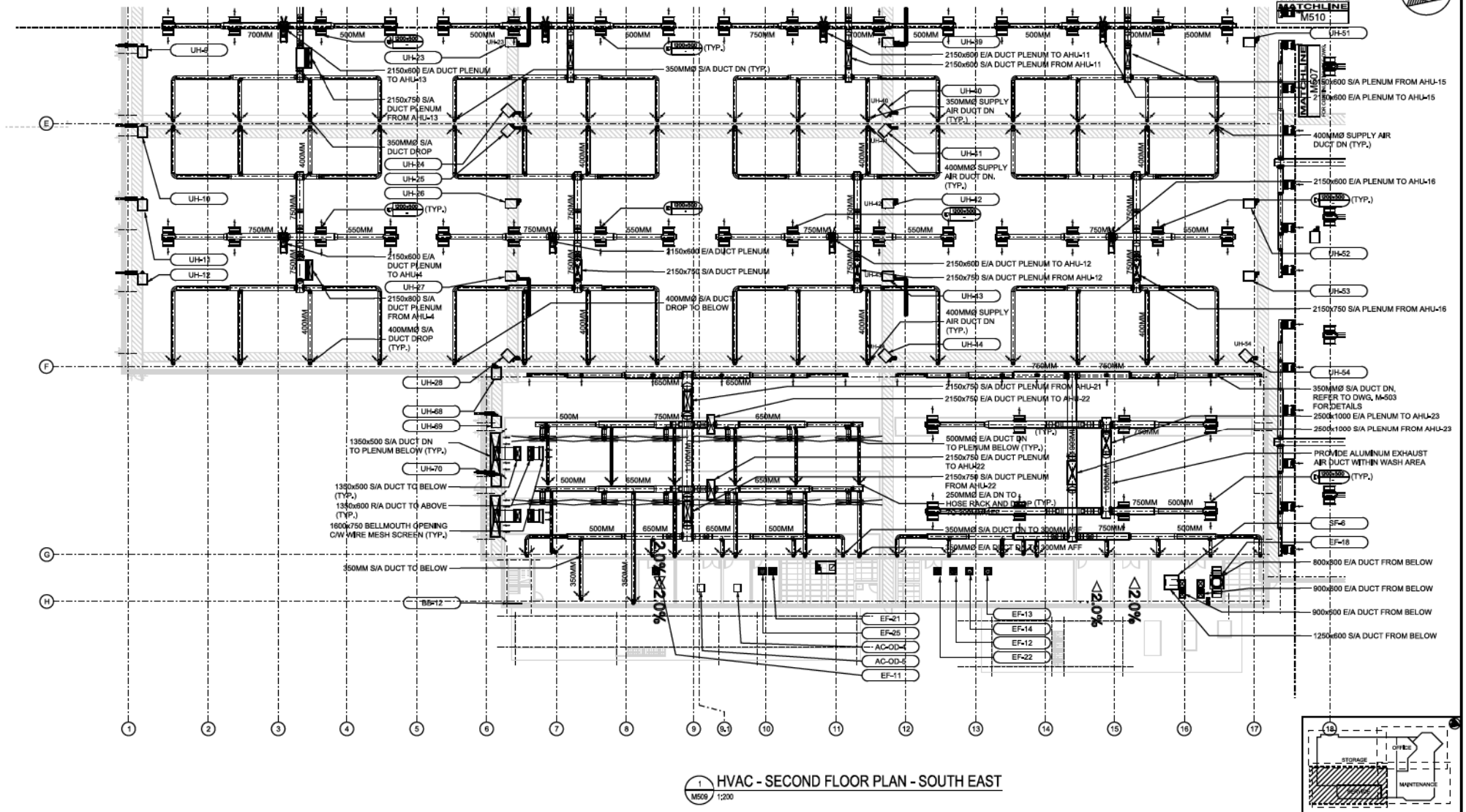


1 M509 HVAC - SECOND FLOOR PLAN - SOUTH EAST
1:200

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S) 0 1 2 3 4 5 6m

Stantec HDR

DESIGNED	V. JOSHI	2014/05/15
DRAWN	S. CHUNG	2014/05/15
CHECKED	P. MARSH	2014/06/13
APPROVED		

McNICOLL BUS GARAGE

H.V.A.C
SECOND FLOOR PLAN
SOUTH EAST

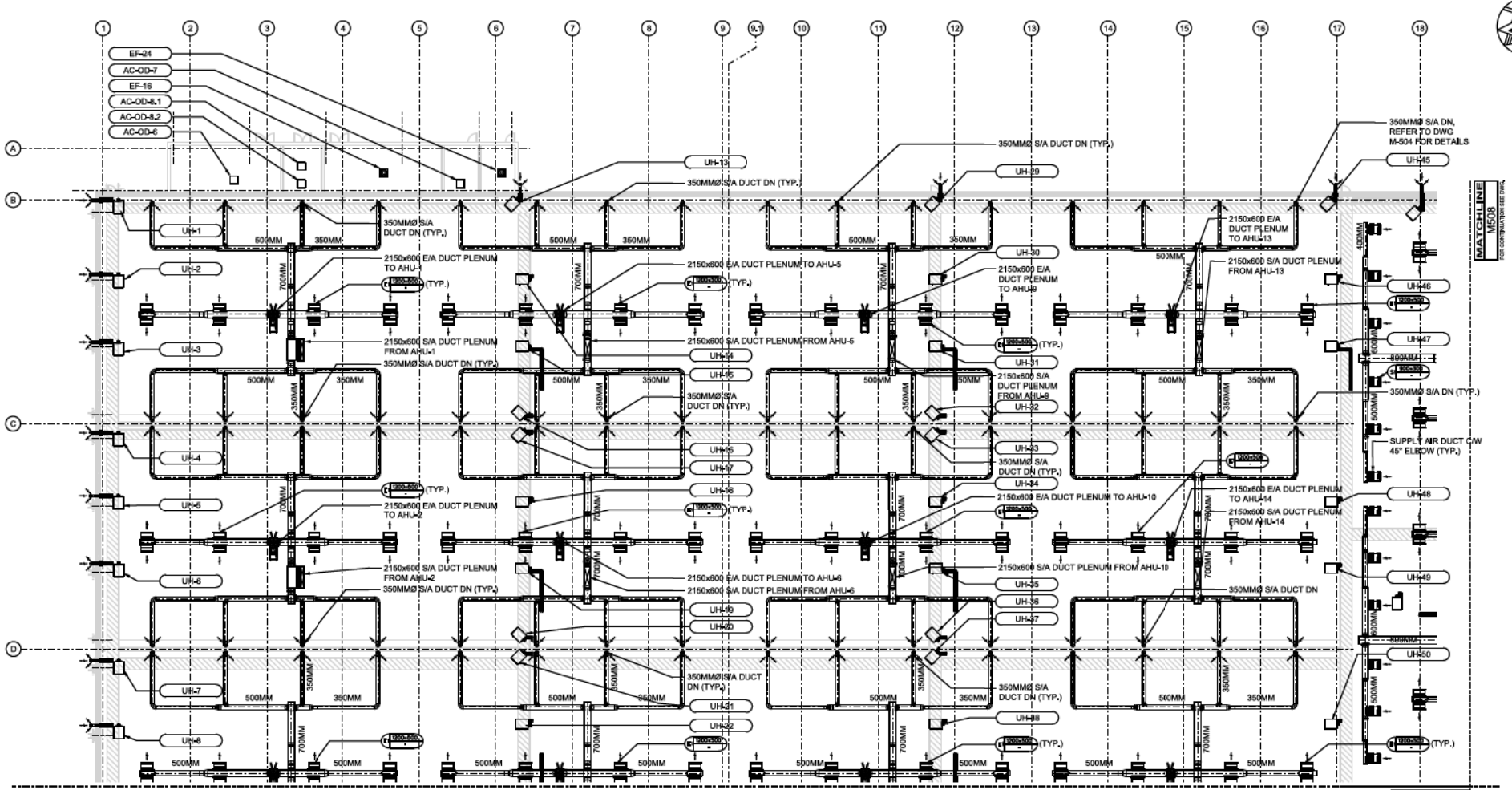
Plot Date: 08-24-2014

Dwg. No. G85-314-M509

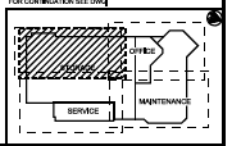
Sheet No.

BLDG. REF. No.
FILE: STN_81a_hv_pln_02_se.dgn
SHEET No.
DRAWING No. G85-314-M509

CADD FILE NAME: pw:\PWAPPPITT012.NorthEast_Pittsburgh\Documents\Toronto_Transit_Commission\KF_McNicoll_Bus_Garage\13.00_CAD\13.02_Contract_Files\CAD_BIM\14_Mech\Sheets\HVAC Sheet - M510 - Second Floor Plan - South West



1 / M510 HVAC - SECOND FLOOR PLAN -SOUTH WEST
1:200



REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S) 0 1 2 3 4 5 6m

Stantec HDR

DESIGNED	V. JOSHI 2014/05/15
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CHECKED	P. MARSH 2014/06/13
APPROVED	

McNICOLL BUS GARAGE

H.V.A.C
SECOND FLOOR PLAN
SOUTH WEST

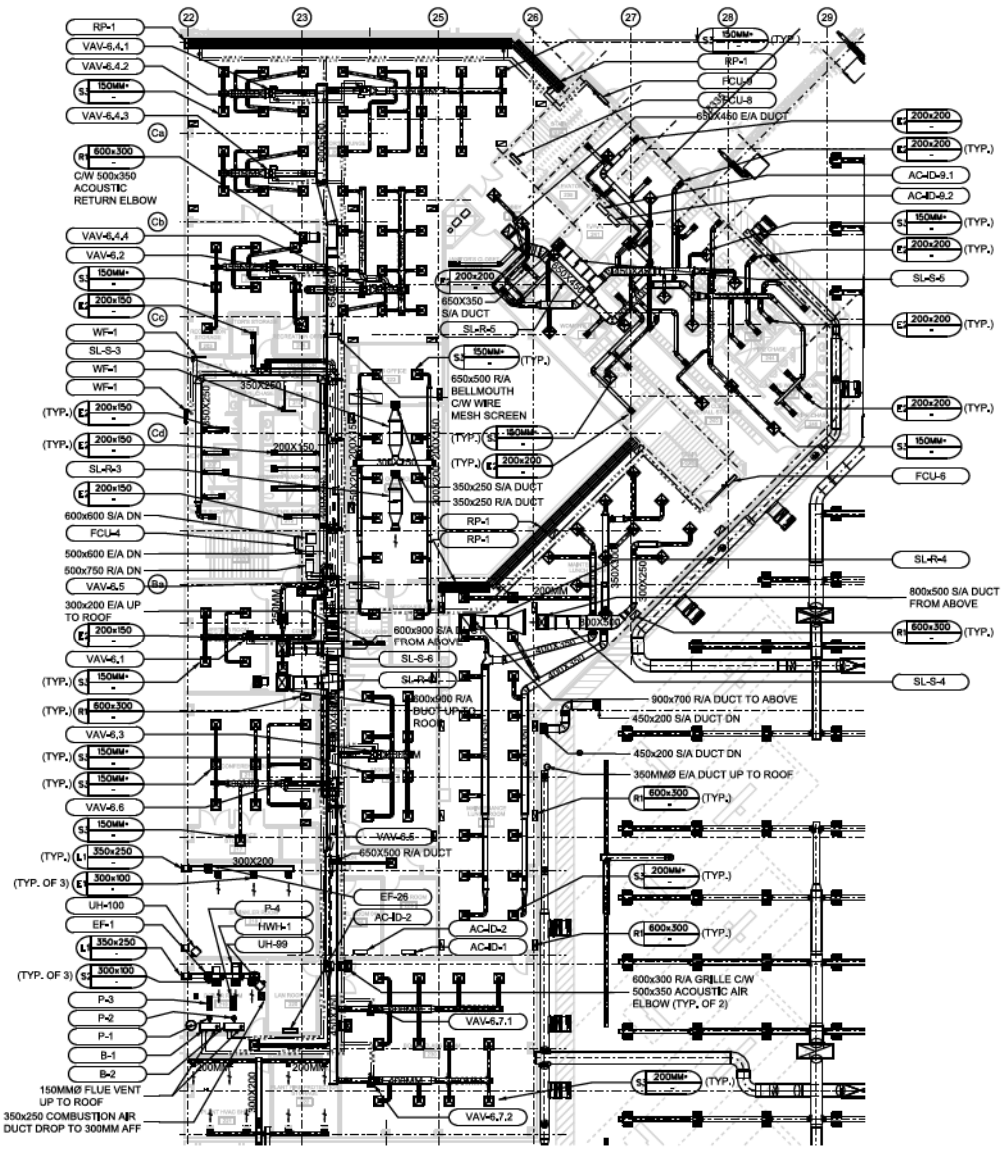
Plot Date: 08-25-2014

Dwg. No. G85-314-M510

Sheet No.

DRAWING No.: G85-314-M510 | SHEET No. | FILE: STN_81s_hv_pln_02_sw.dgn | BLDG. REF. No.

CADD FILE NAME: pw:\\PWAPPPITT012.NorthEast_Pittsburgh\Documents\Toronto_Transit_Commission\KF_McNicoll_Bus_Garage\13.00_CAD\13.02_Contract_Files\CAD_BIM\14_Mech\Sheets\HVAC Sheet - M511 - Second Floor Plan - Office Enlarge



1 M511 HVAC - SECOND FLOOR PLAN - OFFICE ENLARGE 1:150

REVISIONS	REVISIONS						
		SCOPE REVIEW DRAWING NOT FOR CONSTRUCTION	Stantec HDR			DESIGNED V. JOSHI 2014/05/15 DRAWN S. CHUNG 2014/05/15 CHECKED P. MARSH 2014/06/13 APPROVED	McNICOLL BUS GARAGE H.V.A.C SECOND FLOOR PLAN OFFICE ENLARGE

Plot Date: 08-24-2014

Dwg. No. G85-314-M511

Sheet No.

SCALE(S) 0 1 2 3 4 5 6m

DRAWING No.: G85-314-M511 SHEET No.: FILE: STN_81s_hv_pln_02_test.dgn BLDG. REF. No.

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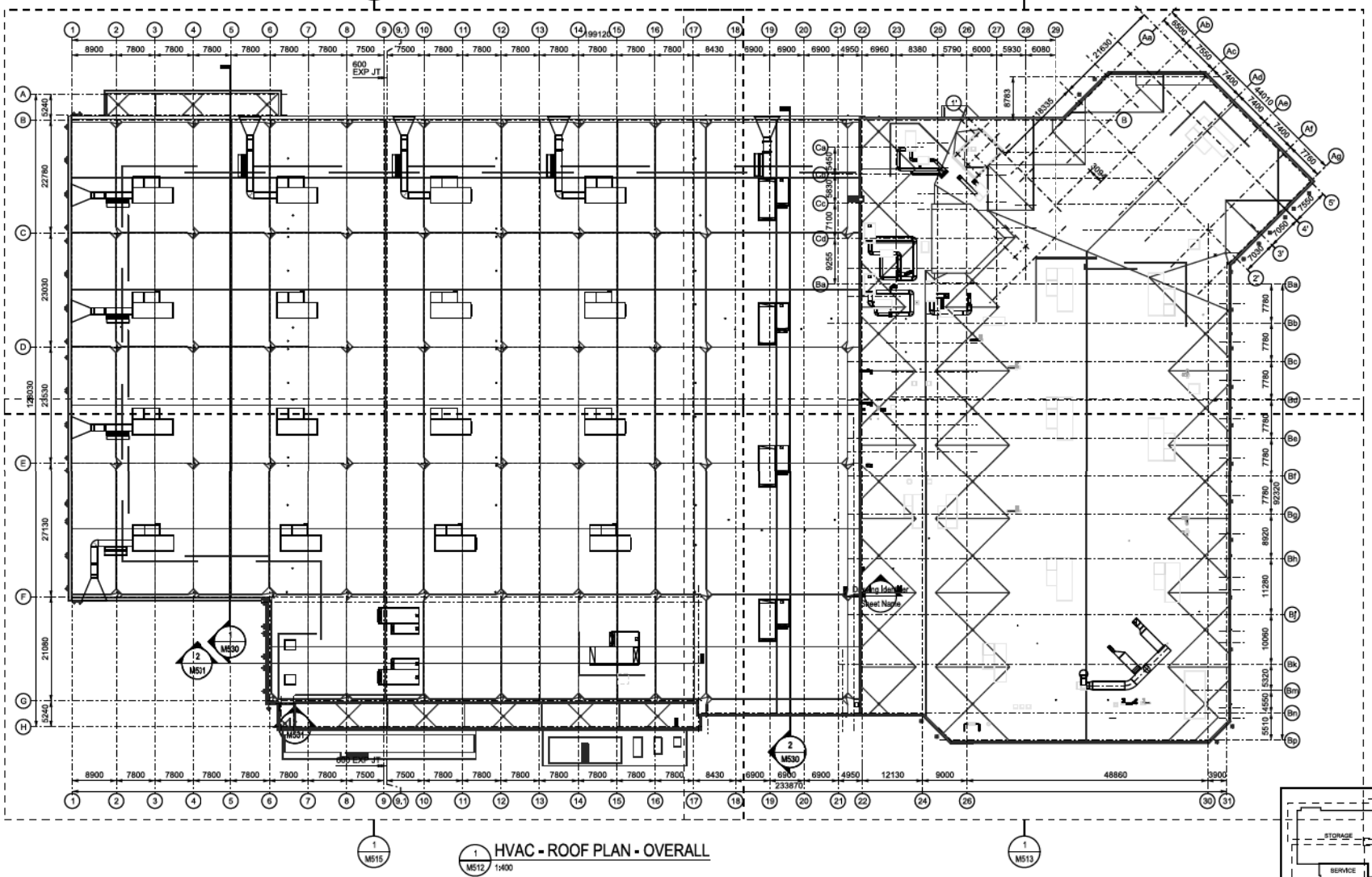

1 M512 HVAC - ROOF PLAN - OVERALL 1:400

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S)

Stantec HDR

DESIGNED	V. JOSHI	2014/05/15
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CHECKED	P. MARSH	2014/06/13
APPROVED		

McNICOLL BUS GARAGE

H.V.A.C
ROOF PLAN
OVERALL

Plot Date: 06-27-2014

Dwg. No. G85-314-M512

Sheet No.

DRAWING No.: G85-314-M512 SHEET No.: FILE: STN_81a_hv_pln_03.dgn BLDG. REF. No.

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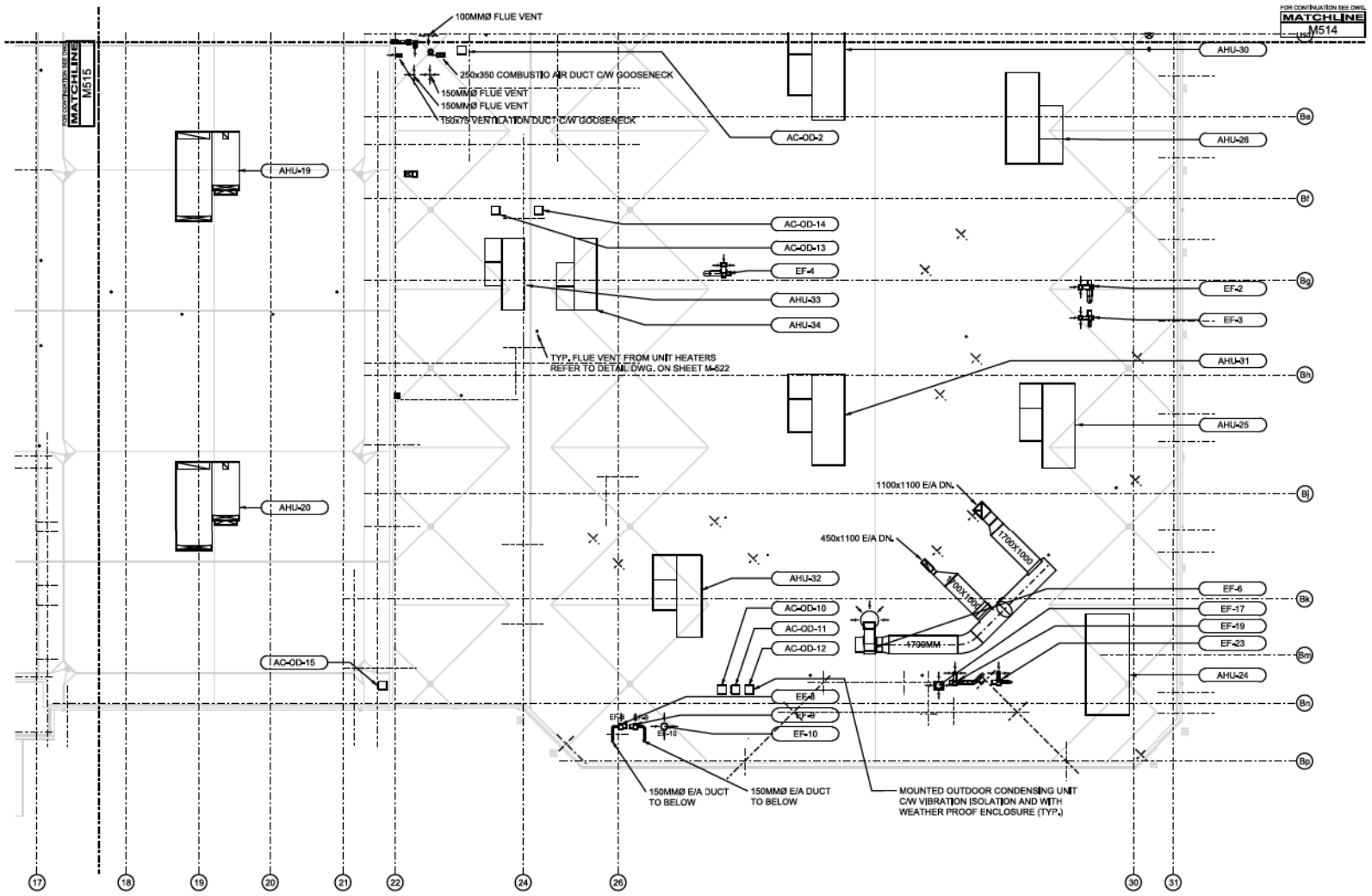
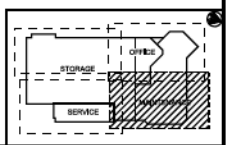


1 / M513 HVAC - ROOF PLAN - NORTH EAST
1:200



REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S) 0 1 2 3 4 5 m

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
APPROVED

McNICOLL BUS GARAGE

H.V.A.C
ROOF PLAN
NORTH EAST

Plot Date: 08-27-2014

Dwg. No. G85-314-M513

Sheet No.

DRAWING No.: G85-314-M513 SHEET No.: FILE: STN_81s_hv_pln_03_redsgn BLDG. REF. No.

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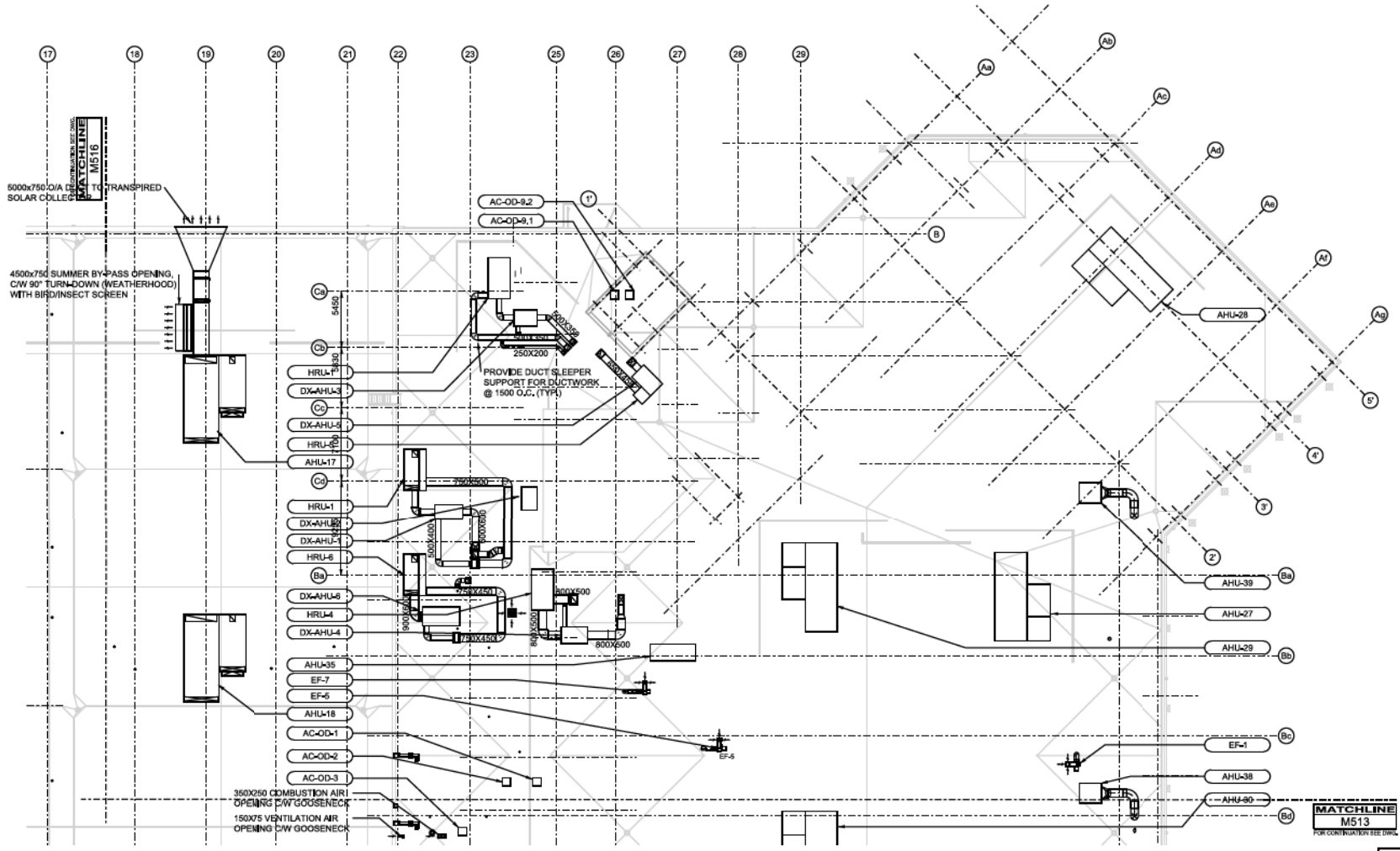

1 M514 HVAC - ROOF PLAN - NORTH WEST 1:200

REVISIONS	REVISIONS						
		SCOPE REVIEW DRAWING NOT FOR CONSTRUCTION	Stantec HDR			McNICOLL BUS GARAGE	Plot Date: 08-27-2014
		SCALE(S) 0 1 2 3 4 5 m			DESIGNED V. JOSHI 2014/05/15 DRAWN S. CHUNG 2014/05/15 CHECKED P. MARSH 2014/06/13 APPROVED	H.V.A.C ROOF PLAN NORTH WEST	Dwg. No. G85-314-M514 / Sheet No.

DRAWING No.: G85-314-M514 SHEET No.: FILE: STN_81s_hv_pln_03_nw.dgn BLDG. REF. No.

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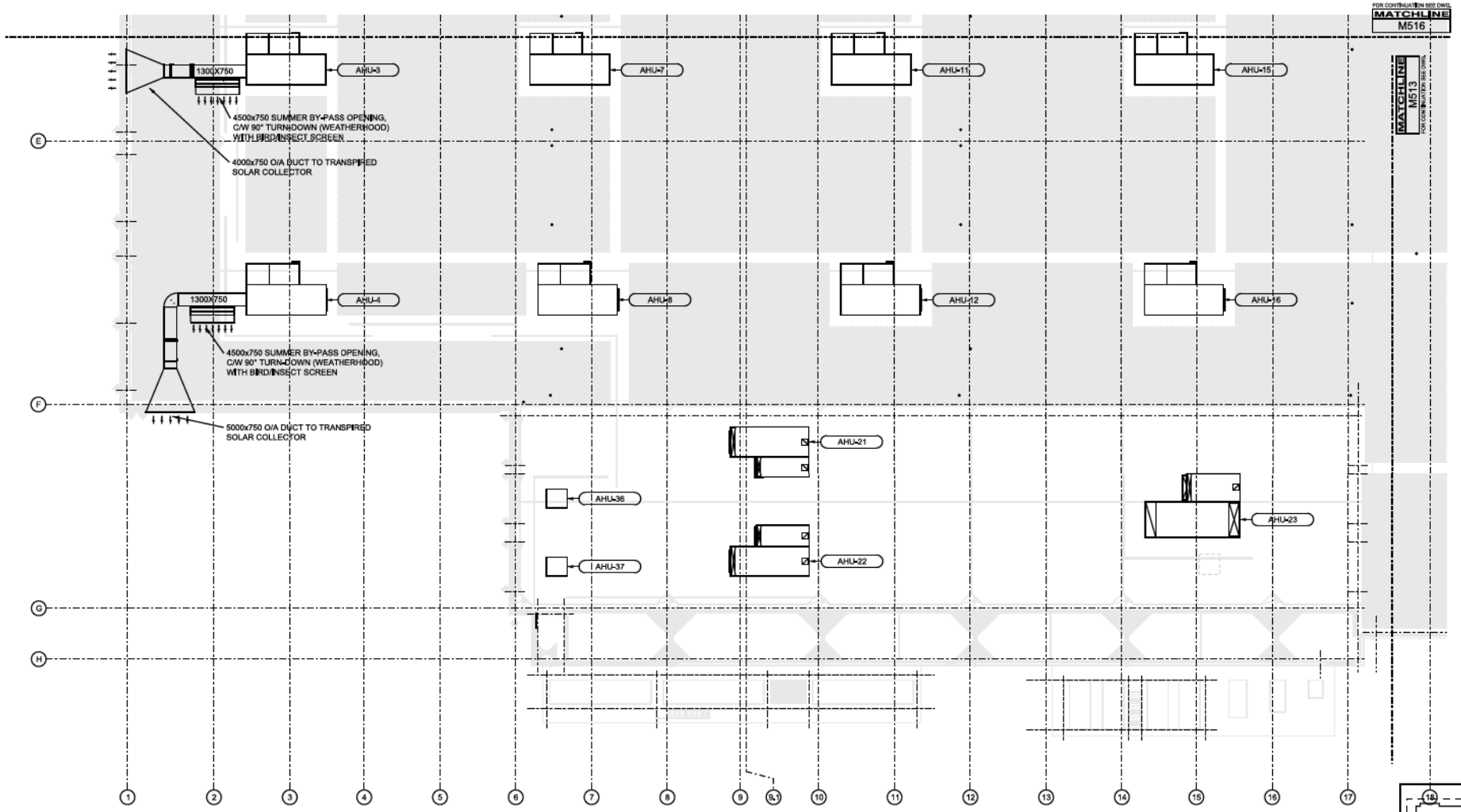

1 M515 HVAC - ROOF PLAN - SOUTH EAST
1:200

BLDG. REF. No.
FILE: STN_81a_hv_dft_03_se.dgn
SHEET No.
DRAWING No.: G85-314-M515

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S) 0 1 2 3 4 5 6m

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
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McNICOLL BUS GARAGE

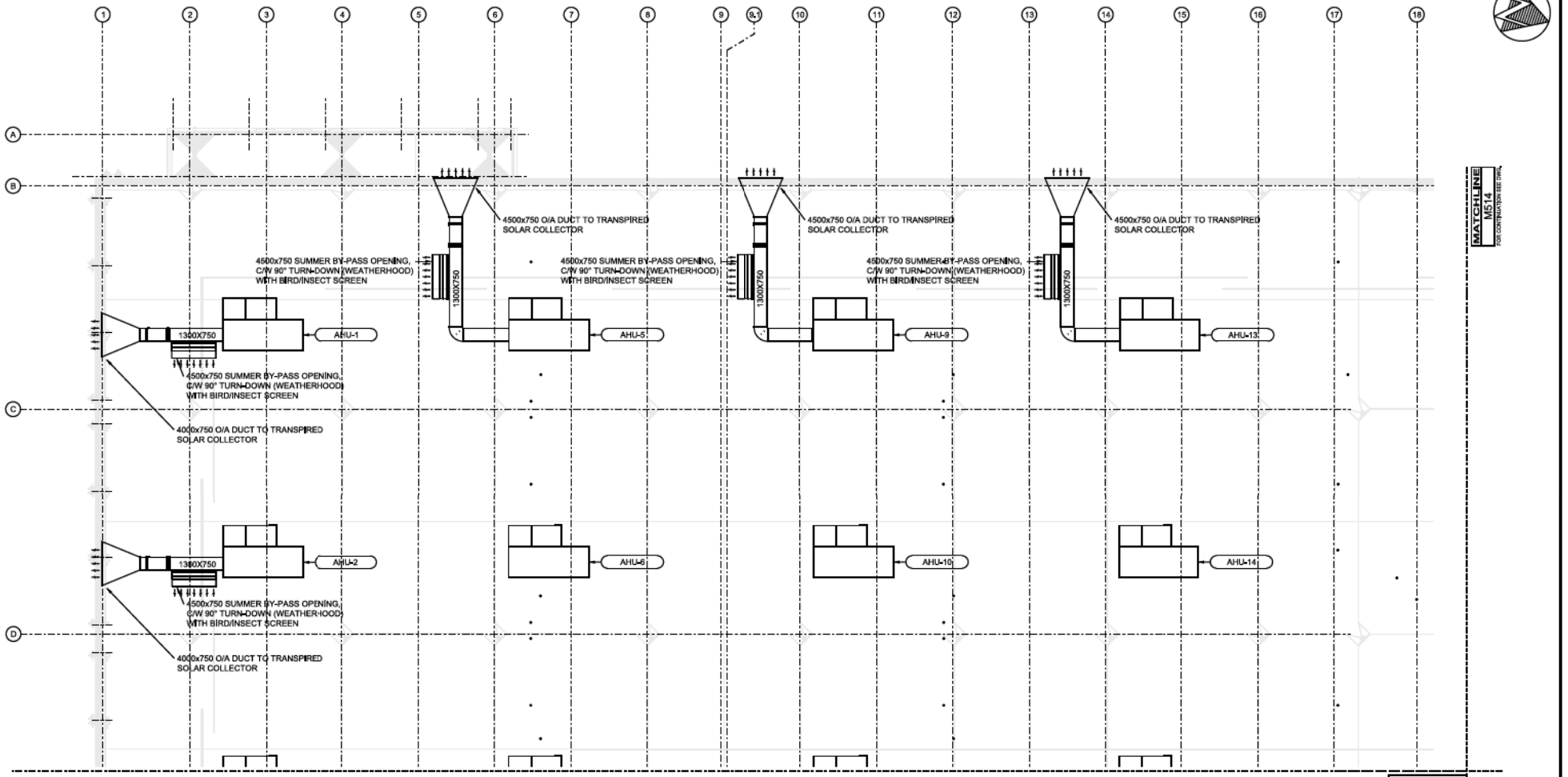
H.V.A.C
ROOF PLAN
SOUTH EAST

Plot Date: 06-24-2014

Dwg. No. G85-314-M515

Sheet No.

CADD FILE NAME: pw:\\PWAPPPITT012.NorthEast_Pittsburgh\Documents\Toronto_Transit_Commission\KF_McNicoll_Bus_Garage\13.00_CAD\13.02_Contract_Files\CAD_BIM\14_Mech\Sheets\HVAC Sheet - M516 - Roof Plan – South West



1 / M516 HVAC - ROOF PLAN - SOUTH WEST
1:200

BLDG. REF. No.
FILE: STN_81a_hv_pln_03_sw.dgn
SHEET No.
DRAWING No.: G85-314-M516

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S) 0 1 2 3 4 5 6m

Stantec HDR

DESIGNED	V. JOSHI	2014/05/15
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APPROVED		

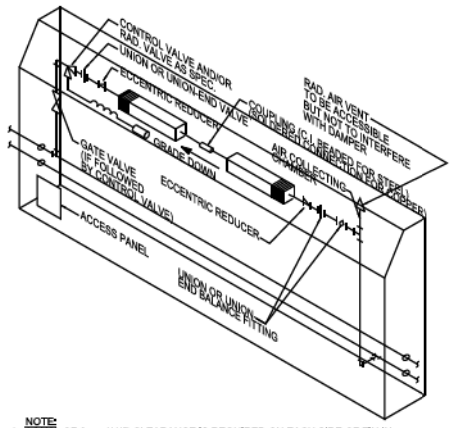
McNICOLL BUS GARAGE

H.V.A.C
ROOF PLAN
SOUTH WEST

Plot Date: 06-24-2014

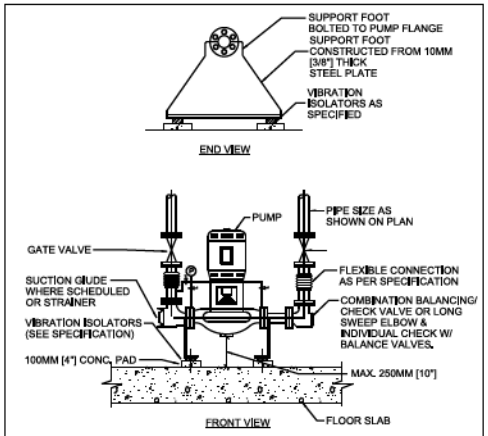
Dwg. No. G85-314-M516

Sheet No.



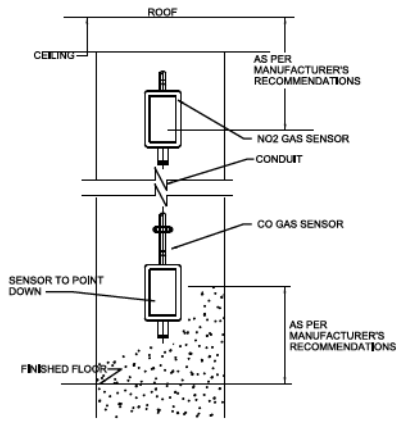
NOTE:
1. A MAX. OF 6mm (1/4") CLEARANCE IS REQUIRED ON EACH SIDE OF FIN IN FLUE SPACE. IF CABINET EXCEEDS FIN LENGTH BY MORE THAN 600mm (24"), BLANK OFF FLUE SPACE AT ENDS OF FIN USING 0.48mm (12 GA) GALVANIZED SHEET METAL.

1 – HOT WATER PIPING TO WALLFIN AND BASEBAORD HEATER
SCALE: N.T.S.



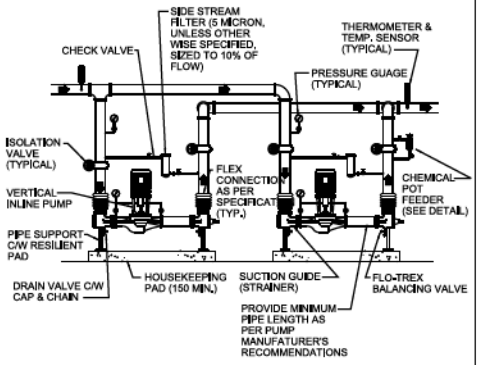
NOTES:
- SUPPORT FOOT TO BE BOLTED TO THE FLOOR SLAB, THROUGH THE CONC. PAD USING NEOPRENE WASHERS AND BUSHINGS ON THE BOLTS (MIN. 2 BOLTS).

2 – VERTICAL IN-LINE PUMP INSTALLATION
SCALE: N.T.S.

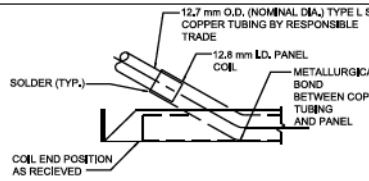


NOTES:
DO NOT MOUNT NEAR FANS, DOORS, OR OTHER SOURCES OF HIGH AIR VELOCITY.

3 – CARBON MONOXIDE AND NO2 SENSOR MOUNTING
SCALE: N.T.S.

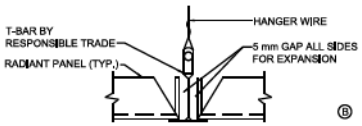


4 – PUMP PIPING ARRANGEMNT
SCALE: N.T.S.



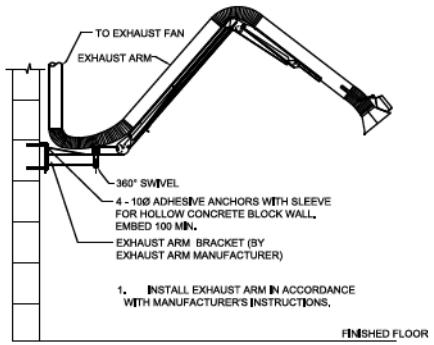
NOTES: 1. PANEL COIL MUST BE RAISED BEFORE INSERTING COPPER TUBING.
2. TOOL FOR RAISING END OF COIL AND RESIZING COIL MAY BE OBTAINED FROM SUPPLIER. (A)

DETAIL - TYPICAL PANEL COIL CONNECTION



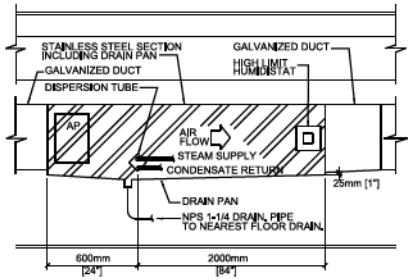
DETAIL - TYPICAL PANEL EXPANSION GAP

5 – RADIANT PANEL DETAIL
SCALE: N.T.S.



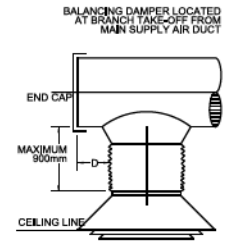
ELEVATION VIEW

6 – SOLDERING FUME EXHAUST ARM
SCALE: N.T.S.



NOTE:
1. REFER TO MANUFATURER'S RECOMMENDATION FOR LOCATION OF DISPERSION TUBE IN RELATION TO DUCT HEIGHT, AND FOR MULTIPLE DUCT-MOUNTED DISPERSION TUBE.

7 – DUCT HUMIDIFIER (ELECTRONIC STEAM TYPE)
SCALE: N.T.S.



8 – DIFFUSER CONNECTION DETAIL
SCALE: N.T.S.

BLDG. REF. No.
FILE: STN_81s_hv_det_01.dgn
SHEET No.
DRAWING No.: G85-314-M520

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S)

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
APPROVED

McNICOLL BUS GARAGE

H.V.A.C DETAILS

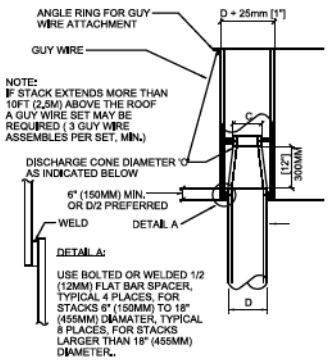
Sheet 1 of 6

Plot Date: 08-24-2014

Dwg. No. G85-314-M520

Sheet No.

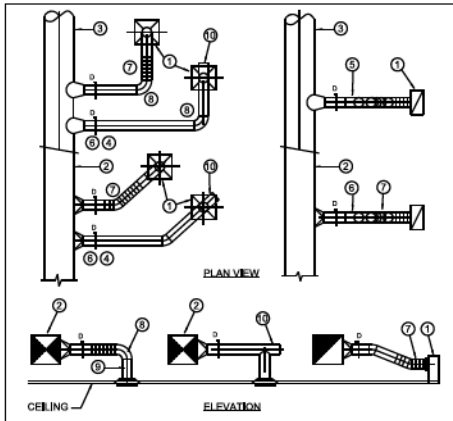
1. REFER TO SPECIFICATION FOR MATERIAL GUAGE THICKNESS
2. APPLICABLE FOR ALL VEHICLE EXHAUST FAN (VEF-XX)



NOTES:
1. REFER TO SPECIFICATION FOR MATERIAL GUAGE THICKNESS
2. APPLICABLE FOR ALL VEHICLE EXHAUST FAN (VEF-XX)

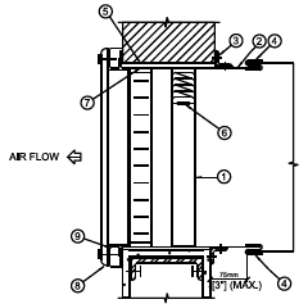
DUCT DIA. 'D'	275MM [11"]	375MM [15"]
CONE DIA. 'C'	225MM [9"]	325MM [13"]

9 – VEHICLE EXHAUST STACK DISCHARGE
SCALE: N.T.S.



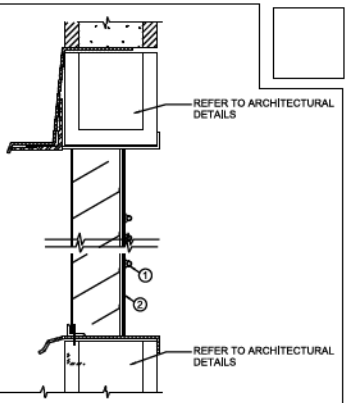
NOTES
1. AIR TERMINAL UNIT AS SCHEDULED
2. RECTANGULAR DUCT - TYP
3. ROUND DUCT - TYP
4. DUCT SIZE TO MATCH DIFFUSER NECK SIZE
5. DUCT SIZE AS SCHEDULED - SEE MD-822
6. RIGID DUCT
7. FLEX DUCT - MAX. LENGTH AS SPECIFIED - MAX. BEND PERMITTED 45 DEG
USE ALL RIGID DUCT FOR EXPOSED STRUCTURE.
8. RIGID DUCT ELBOW - RADIUS = 1.5 x DIA. MIN.
9. RIGID DUCT MIN. 1 DUCT DIA. LONG FROM ELBOW TO DIFFUSER.
10. PROVIDE CUSHION HEAD FOR DIFFUSER WHERE CEILING SPACE IS LIMITED. TRANSITION TO EQUIVALENT RECTANGULAR DUCT AS REQUIRED. CUSHION HEAD LENGTH = 1x DIFFUSER DIAMETER

10 – DUCT CONNECTIONS TO AIR TERMINAL UNITS
SCALE: N.T.S.



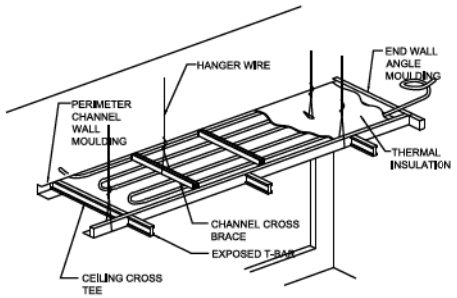
NOTES:
1 APPROVED SHUTTER TYPE FIRE DAMPER- THINLINE.
2 GALVANIZED STEEL SLEEVE - MATERIAL THICKNESS 3.28mm [10 Ga.]
3 RETAINING ANGLE IRON - SEE SMACNA DETAILS.
4 BREAKAWAY JOINT - USING "S" SLIP CONNECTION ON TOP AND BOTTOM & DRIVE SLIP ON SIDES. CAULK AIRTIGHT.
5 OPENING SIZE - SEE SMACNA DETAILS.
6 FUSIBLE LINK
7 SLEEVE - FLANGED TO FORM RETAINING ANGLE.
8 REGISTER SIZE TO SUITE BOX FRAME - SECURED TO BOX FRAME.
9 EXTENSION BOX FRAME WITH MITRED FINISHED CORNERS - TO RECEIVE SECURING SCREWS FOR REGISTER OR GRILLE. ALTERNATIVE METHODS OF SECURING GRILLES & REGISTER WILL BE CONSIDERED.

11 – FIRE DAMPER + SUPPLY GRILLE INSTALLATION
SCALE: N.T.S.

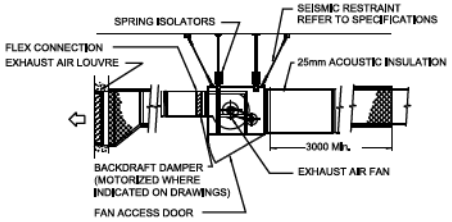


NOTES: (6)
1. 16mm [5/8"] SECURITY BARS AT 200mm [8"] O.C. BOTH WAYS DRILL THROUGH SLEEVE AND WELD BOTH ENDS AND ALL INTERSECTIONS. PAINT WITH GALVACON.
2. BIRD SCREEN.

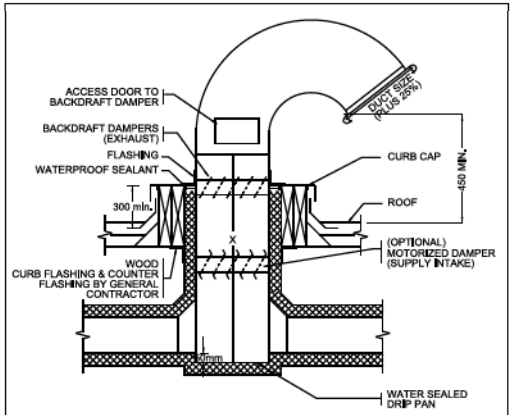
12 – LOUVRE IN WALL
SCALE: N.T.S.



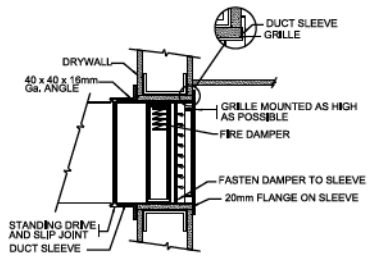
13 – T-BAR CEILING RADIANT PANEL INSTALLATION
SCALE: N.T.S.



14 – EXHAUST FAN DETAIL
SCALE: N.T.S.



15 – TYPICAL GOOSENECK EXHAUST OR INTAKE
SCALE: N.T.S.



NOTE:
INSTALLATION SHALL MEET THE DUCT MANUFACTURER'S LISTED INSTALLATION INSTRUCTIONS

16 – FIRE DAMPER BEHIND WALL GRILLE
SCALE: N.T.S.

BLDG. REF. No.
FILE: STN_81s_hv_det_02.dgn
SHEET No.
DRAWING No.: G85-314-M521

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Plot Date: 08-26-2014

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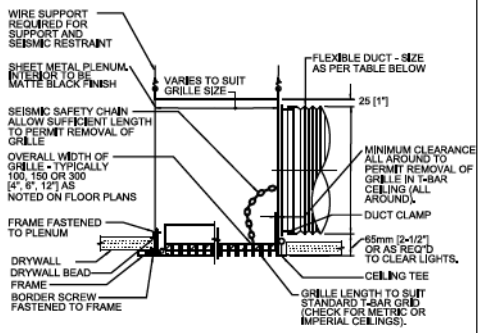
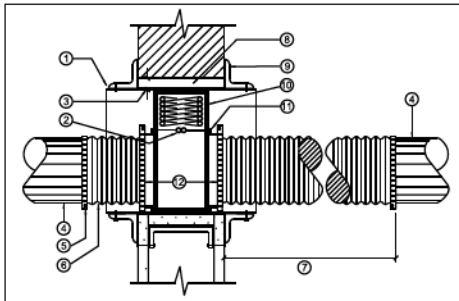


FLEXIBLE CONNECTION SIZE TABLE

GRILLE SIZE	600x100 [24"x4"]	600x150 [24"x6"]	600x300 [24"x12"]	600x450 [24"x18"]
FLEX. CONNEC.	200 [8"] DIA.	250 [10"] DIA.	300 [12"] OVAL	350 [14"] OVAL

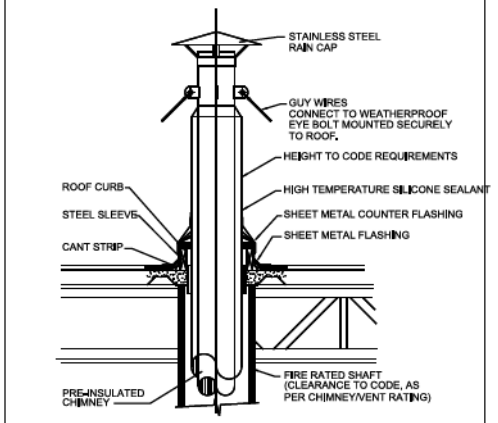
NOTE:
INSTALL BALANCING DAMPER AT DUCT TAKEOFF.

17 RETURN/EXHAUST GRILLE WITH PLENUM
SCALE: N.T.S.

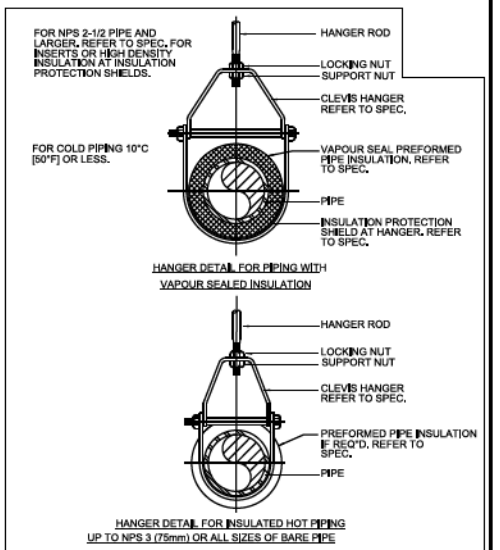


NOTES: (#)
1. GALVANIZED STEEL SLEEVE.
2. FUSIBLE LINK.
3. 12.5mm [1/2"] MAXIMUM CLEARANCE.
4. DUCT.
5. CLAMP CONNECTION ON FLEX.
6. FLEXIBLE CONNECTION.
7. FLEXIBLE DUCT LENGTH - 3 X DIAMETER.
8. OPENING SIZE. SEE STANDARD SMACNA B.C. DETAIL.
9. STEEL RETAINING ANGLES. SEE STANDARD SMACNA B.C. DETAIL.
10. APPROVED TYPE FIRE DAMPER.
11. TO BE AIR TIGHT.
12. BREAK-AWAY JOINTS.

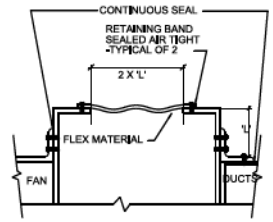
18 ACCESS TO FIRE DAMPER (ROUND DUCT TO 300MM [12"] ONLY)
SCALE: N.T.S.



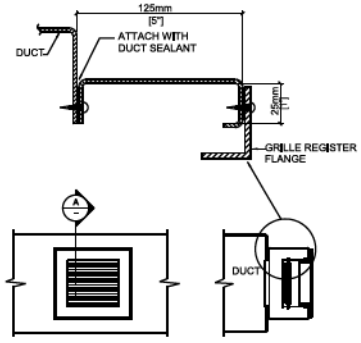
19 BOILER VENT THROUGH ROOF
SCALE: N.T.S.



19 PIPE HANGERS
SCALE: N.T.S.

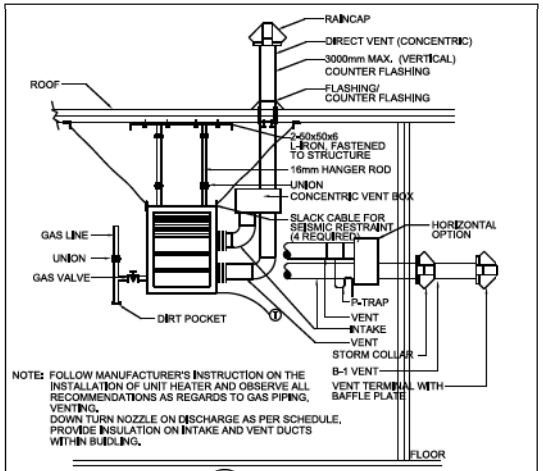


21 FAN/DUCT FLEXIBLE CONNECTION
SCALE: N.T.S.



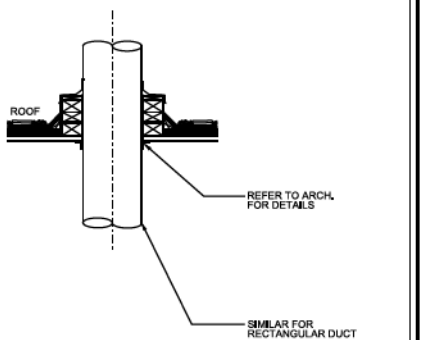
NOTES:
1. FABRICATE GRILLE MOUNTING FROM 0.91mm [20 GA] GALVANIZED STEEL
2. TYPICAL FOR ROUND OR RECTANGULAR DUCTS

22 GRILLE MOUNTED ON EXPOSED RECTANGULAR DUCT
SCALE: N.T.S.



NOTE: FOLLOW MANUFACTURER'S INSTRUCTION ON THE INSTALLATION OF UNIT HEATER AND OBSERVE ALL RECOMMENDATIONS AS REGARDS TO GAS PIPING, VENTING.
DOWN TURN NOZZLE ON DISCHARGE AS PER SCHEDULE.
PROVIDE INSULATION ON INTAKE AND VENT DUCTS WITHIN BUILDING.

23 DETAIL
SCALE: N.T.S.



24 DUCT PENETRATING ROOF DETAIL
SCALE: N.T.S.

BLDG. REF. No.
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DRAWING No.: G85-314-M522

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Plot Date: 06-24-2014

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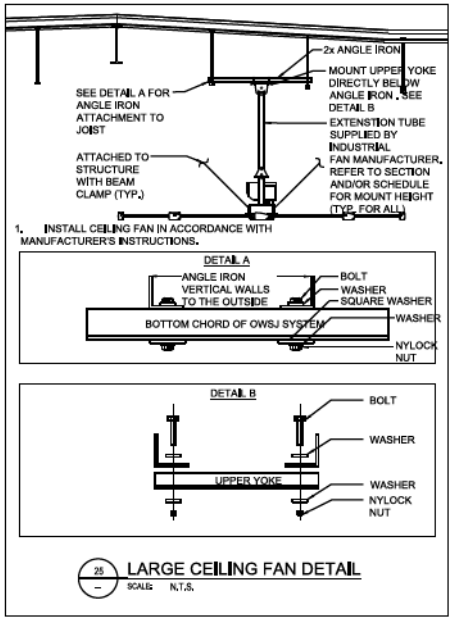
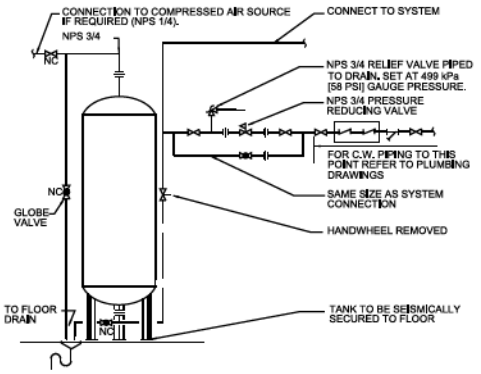
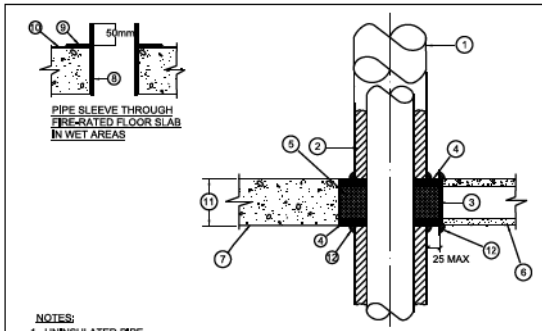


25 LARGE CEILING FAN DETAIL
SCALE: N.T.S.



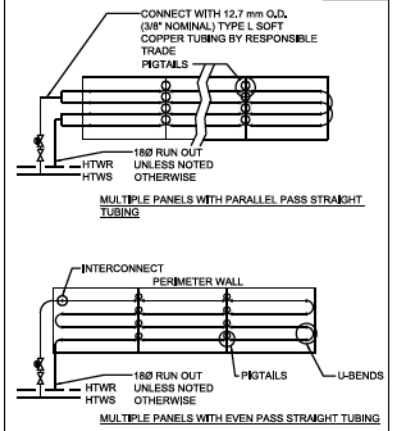
NOTES:
1. LOCATE ALL VALVES FOR CONVENIENT ACCESS WHEN STANDING ON FLOOR.
2. ALL PIPES TO BE THE SAME SIZE AS THE CONNECTION SIZE TO THE SYSTEM AND NOT LESS THAN NPS 3/4. (SEE DRAWINGS FOR SYSTEM CONNECTION SIZES)

26 VERTICAL DIAPHRAM EXPANSION TANK
SCALE: N.T.S.



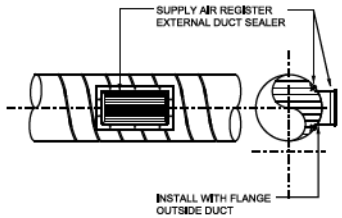
NOTES:
1. UNINSULATED PIPE.
2. INSULATION (AS SPECIFIED). TERMINATE INSULATION AT FIRE STOP.
3. 0.61mm [24 GA] GALVANIZED STEEL SLEEVE (NOT REQ'D. FOR CORE DRILLED CONCRETE OPENINGS). SEE NOTE 8 FOR WET AREAS.
4. MIN. 12mm THICK - U.L.C. APPROVED FIRE STOP SEALANT. SEAL BOTH SIDES (TO MAINTAIN RATING ON GYPROC WALLS; TO RETAIN MINERAL WOOL INSULATION; TO SEAL VAPOUR BARRIER ON COLD PIPES).
5. MINERAL WOOL INSULATION - MANSON "CERAFIBER" OR CARBORUNDUM "FIBERFRAX" TIGHTLY PACKED.
6. FIRE RATED GYPROC WALL.
7. FIRE RATED CONCRETE FLOOR OR WALL.
8. PIPE SLEEVE (SCHED. 40).
9. FLANGE WELDED TO SLEEVE.
10. WATERPROOF MEMBRANE.
11. OVERALL THICKNESS OF MINERAL FIBER PACKING (5) AND FIRE STOP SEALANT (4) TO ENSURE REQUIRED FIRE - RESISTANCE RATING OF SEPARATION.
12. BEAD OF FIRE STOP SEALANT.
13. PIPE INSTALLATION TO ENSURE THAT NO PIPE EXPANSION OCCURS AT FIRE STOP.
14. THE ASSEMBLY MUST COMPLY WITH A ULC LISTED FIRE STOP SYSTEM.

27 PIPE PENETRATION THROUGH FIRE RATED SEPERATION
SCALE: N.T.S.

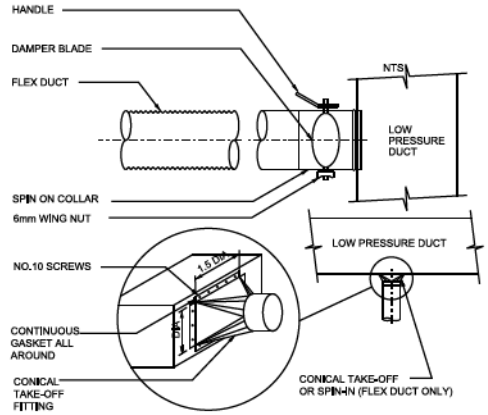


NOTES: REFER TO DETAIL # (RADIANT PANEL DETAIL) THIS DRAWING FOR INTERCONNECT, PIGTAIL AND U-BEND CONNECTIONS.

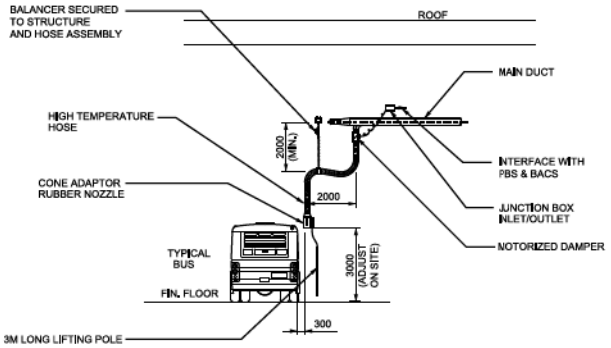
28 RADIANT PANEL CONNECTION DETAIL
SCALE: N.T.S.



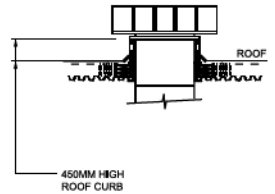
29 REGISTER AT SPIRAL DUCT DETAIL
SCALE: N.T.S.



30 DUCT TAKE-OFF DETAIL
SCALE: N.T.S.



31 TAIL PIPE EXHAUST DETAIL (TYP.)
SCALE: N.T.S.



32 VENT HOOD DETAIL
SCALE: N.T.S.

BLDG. REF. No.
FILE: STN_81s_hv_det_04.dgn
SHEET No.
DRAWING No.: G85-314-M523

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Plot Date: 08-24-2014

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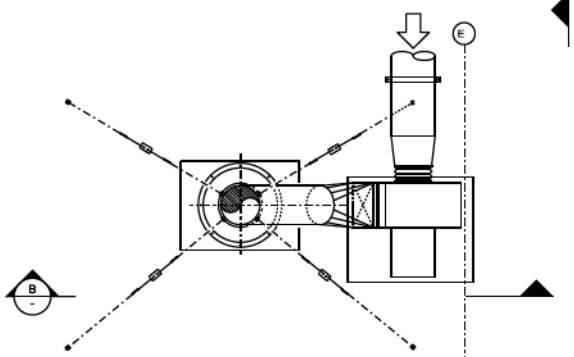
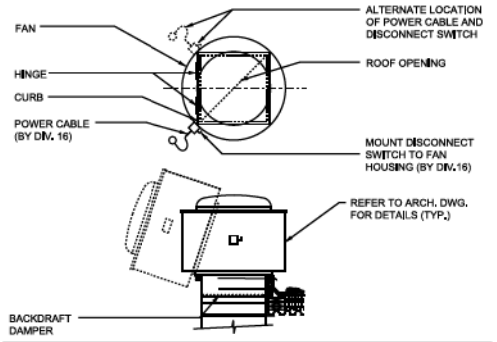


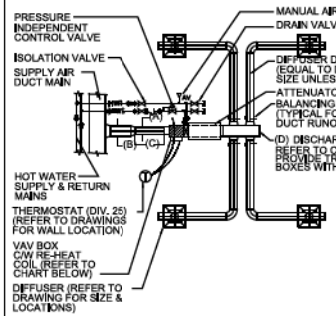


NOTES

A. MECHANICAL CONTRACTOR TO COORDINATE ORIENTATION OF ROOF CURB HINGE, AS PER THIS DETAIL, IN RELATION TO ROOF PENETRATION.

B. SIMILAR ARRANGEMENT FOR DOWNBLAST TYPE EXHAUST FAN.

33 ROOF MOUNTED EXHAUST FAN DETAIL (TYP.)
SCALE: N.T.S.



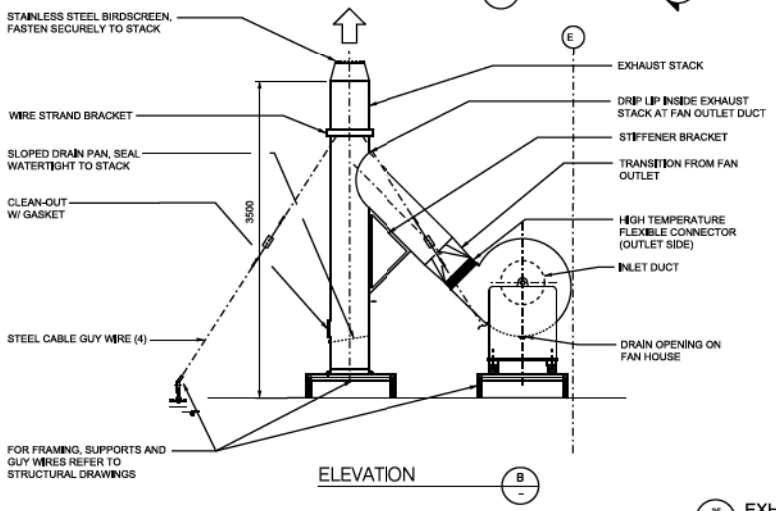
BOX SIZE	(A) mm	(B) mm	(C) mm	(D) mm
4	100Ø	150Ø	400	300X200
5	125Ø	150Ø	500	300X200
6	150Ø	200Ø	600	300X200
7	175Ø	200Ø	700	300X250
8	200Ø	250Ø	800	300X250
9	225Ø	250Ø	900	350X300
10	250Ø	300Ø	1000	350X300
12	300Ø	350Ø	1200	400X400
14	350Ø	400Ø	1400	500X450
16	400Ø	450Ø	1600	600X450

NOTES
1. (C) IS THE STRAIGHT LENGTH (Min.) OF DUCT EQUAL TO 4 TIMES THE INLET DIAMETER OF THE BOX.
2. ONE THERMOSTAT PER VAV BOX UNLESS NOTED OTHERWISE. EXACT LOCATION TO BE CONFIRMED WITH ARCHITECT PRIOR TO INSTALLATION, REFER TO DRAWINGS.

34 AIR VALVE INSTALLATION (PRE-HEAT COIL)
SCALE: N.T.S.

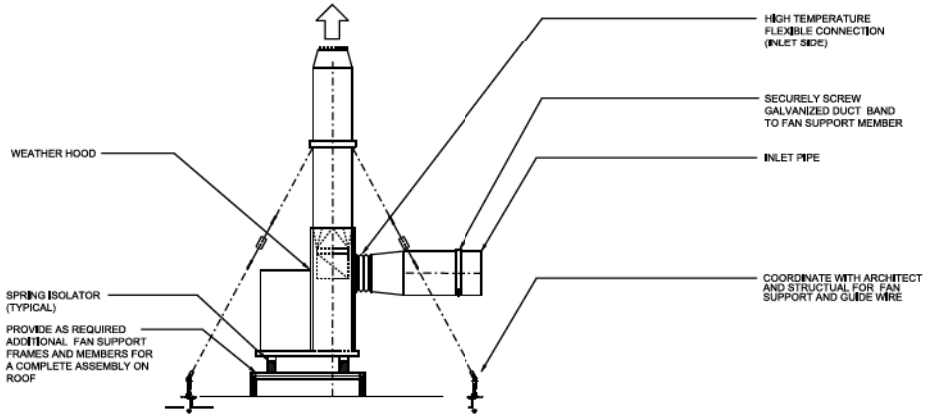
28

PARTIAL PLAN A



ELEVATION B

28



ELEVATION C

35 EXHAUST FANS EF-XX (TYP.)
SCALE: N.T.S.

BLDG. REF. No.
FILE: STN_81s_hv_det_05.dgn
SHEET No.
DRAWING No.: G85-314-M524

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Plot Date: 06-24-2014

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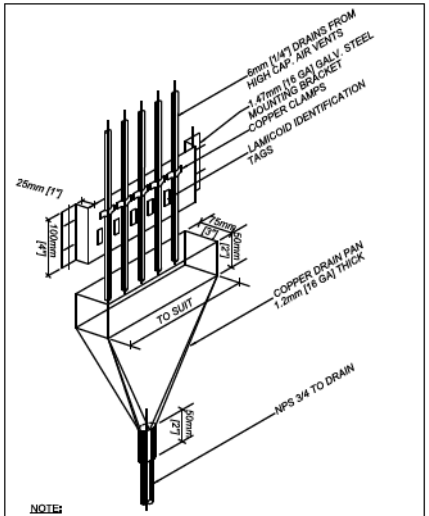
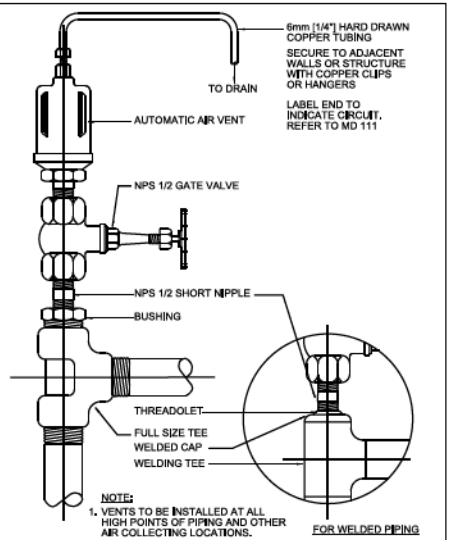
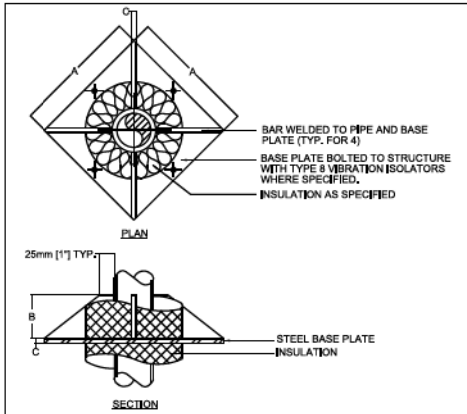
Sheet No.



36 – AIR VENT DRAIN DETAIL
SCALE: N.T.S.

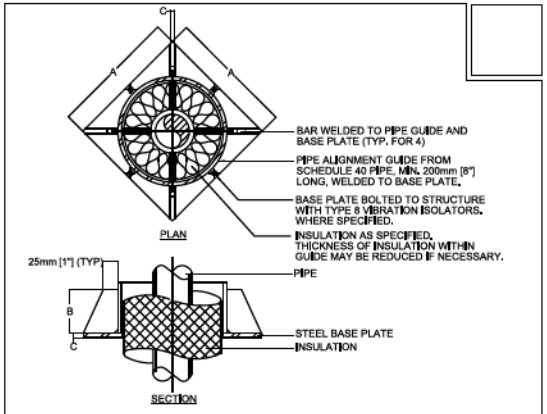


37 – AUTOMATIC AIR VENT (HIGH CAPACITY)
SCALE: N.T.S.



PIPE SIZE	A	B	C
NPS 2	250mm [10"]	100mm [4"]	9.5mm [3/8"]
NPS 2-1/2	400mm [16"]	150mm [6"]	12.5mm [1/2"]
NPS 3	400mm [16"]	175mm [7"]	12.5mm [1/2"]
NPS 4	425mm [17"]	175mm [7"]	12.5mm [1/2"]
NPS 5	475mm [19"]	200mm [8"]	12.5mm [1/2"]
NPS 6	525mm [21"]	200mm [8"]	12.5mm [1/2"]
NPS 8	610mm [24"]	254mm [10"]	19.0mm [3/4"]
NPS 10	711mm [28"]	355mm [14"]	19.0mm [3/4"]

38 – PIPE ANCHOR AT FLOOR SLAB
SCALE: N.T.S.



PIPE SIZE	A	B	C
NPS 2	250mm [10"]	100mm [4"]	9.5mm [3/8"]
NPS 2-1/2	400mm [16"]	150mm [6"]	12.5mm [1/2"]
NPS 3	400mm [16"]	175mm [7"]	12.5mm [1/2"]
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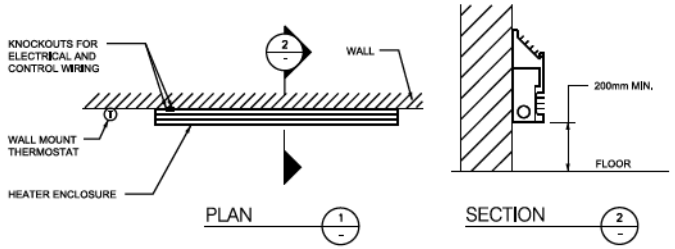
NPS 5	475mm [19"]	200mm [8"]	12.5mm [1/2"]
NPS 6	525mm [21"]	200mm [8"]	12.5mm [1/2"]
NPS 8	610mm [24"]	254mm [10"]	19.0mm [3/4"]
NPS 10	711mm [28"]	355mm [14"]	19.0mm [3/4"]

39 – PIPE GUIDE AT FLOOR SLAB
SCALE: N.T.S.



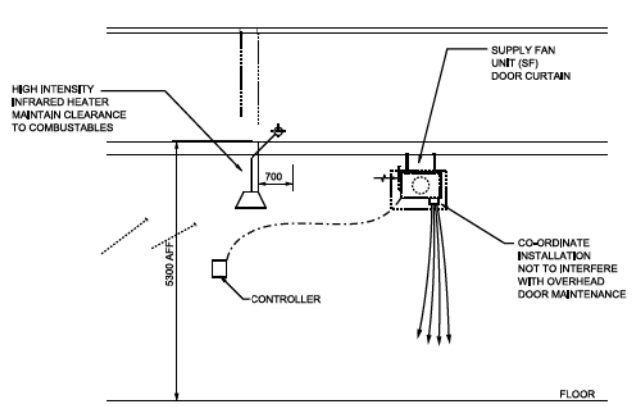
NOTES

A. REFER TO PLAN DRAWINGS AND SCHEDULE FOR HEATER SELECTIONS AND LOCATIONS.

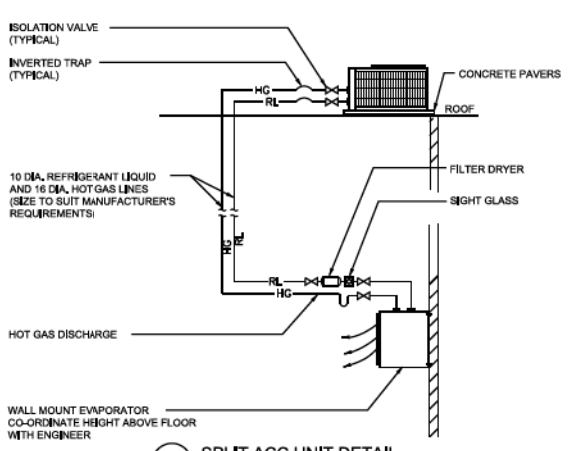
B. REFER TO PLAN DRAWINGS FOR QUANTITY AND LOCATIONS OF THERMOSTATS. CO-ORDINATE FINAL LOCATIONS WITH THE ENGINEER.

C. CO-ORDINATE HEATER INSTALLATION WITH ARCHITECTURAL FINISHES.

40 – BASEBOARD HEATER (STANDALONE ENCLOSURE) DETAIL
SCALE: N.T.S.



41 – AIR CURTAIN INSTALLATION
SCALE: 1:50



42 – SPLIT ACC UNIT DETAIL
SCALE: N.T.S.

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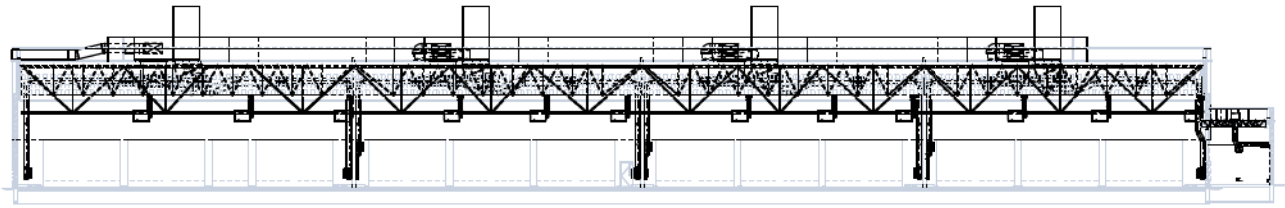
Plot Date: 06-24-2014

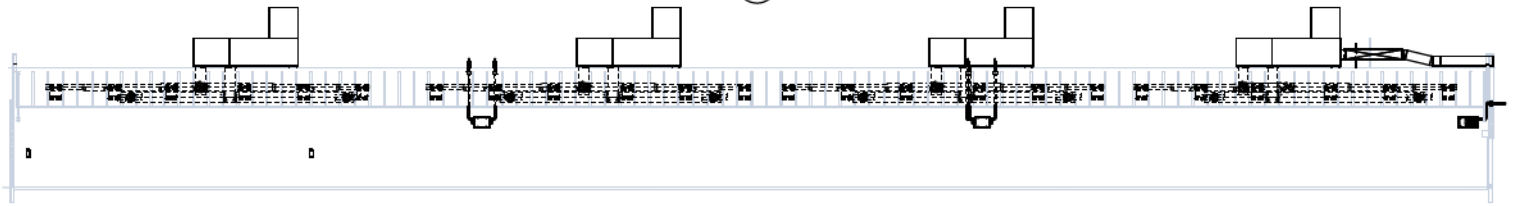
Dwg. No. G85-314-M525

Sheet No.

BLDG. REF. No.
FILE: STN_81s_hv_det_06.dgn
SHEET No.
DRAWING No. G85-314-M525



1 M530 SECTION 1:200



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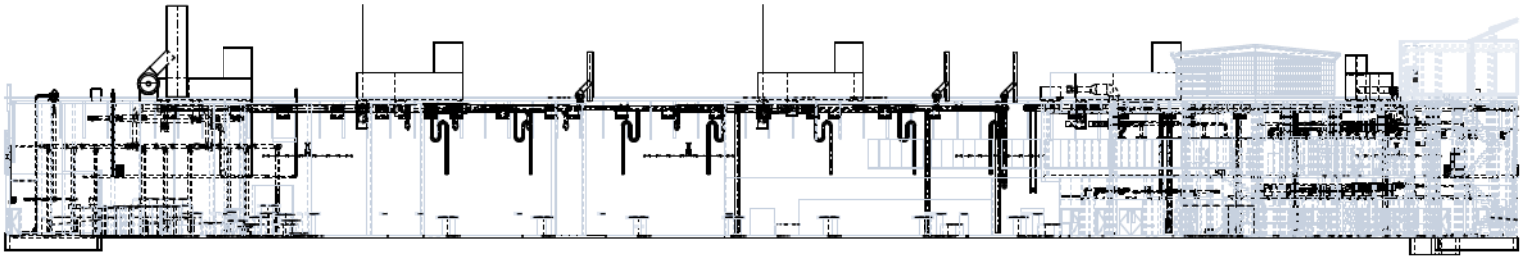

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DRAWING No.: G85-314-M530

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		SCALE(S)						

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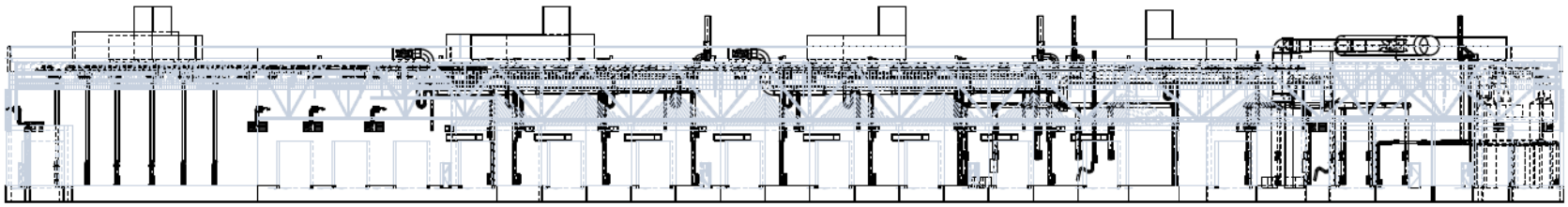

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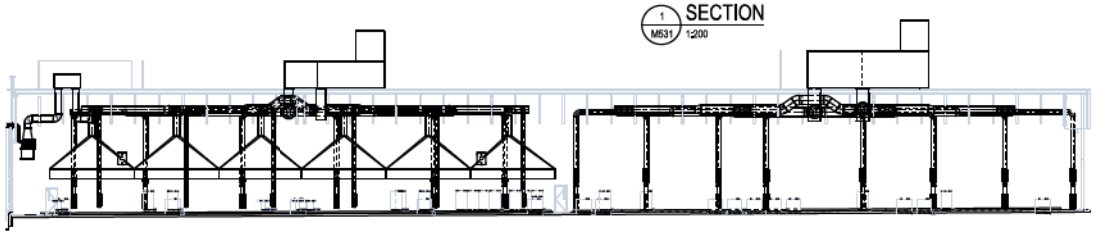

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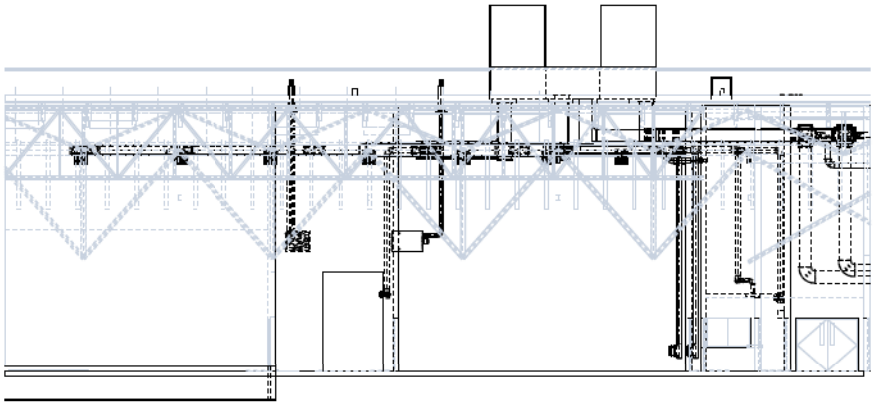

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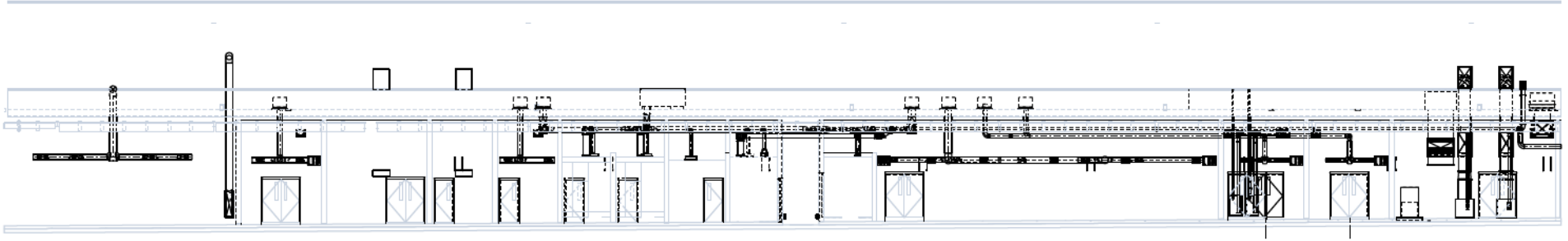

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DRAWING No.: G85-314-M531

REVISIONS	REVISIONS							
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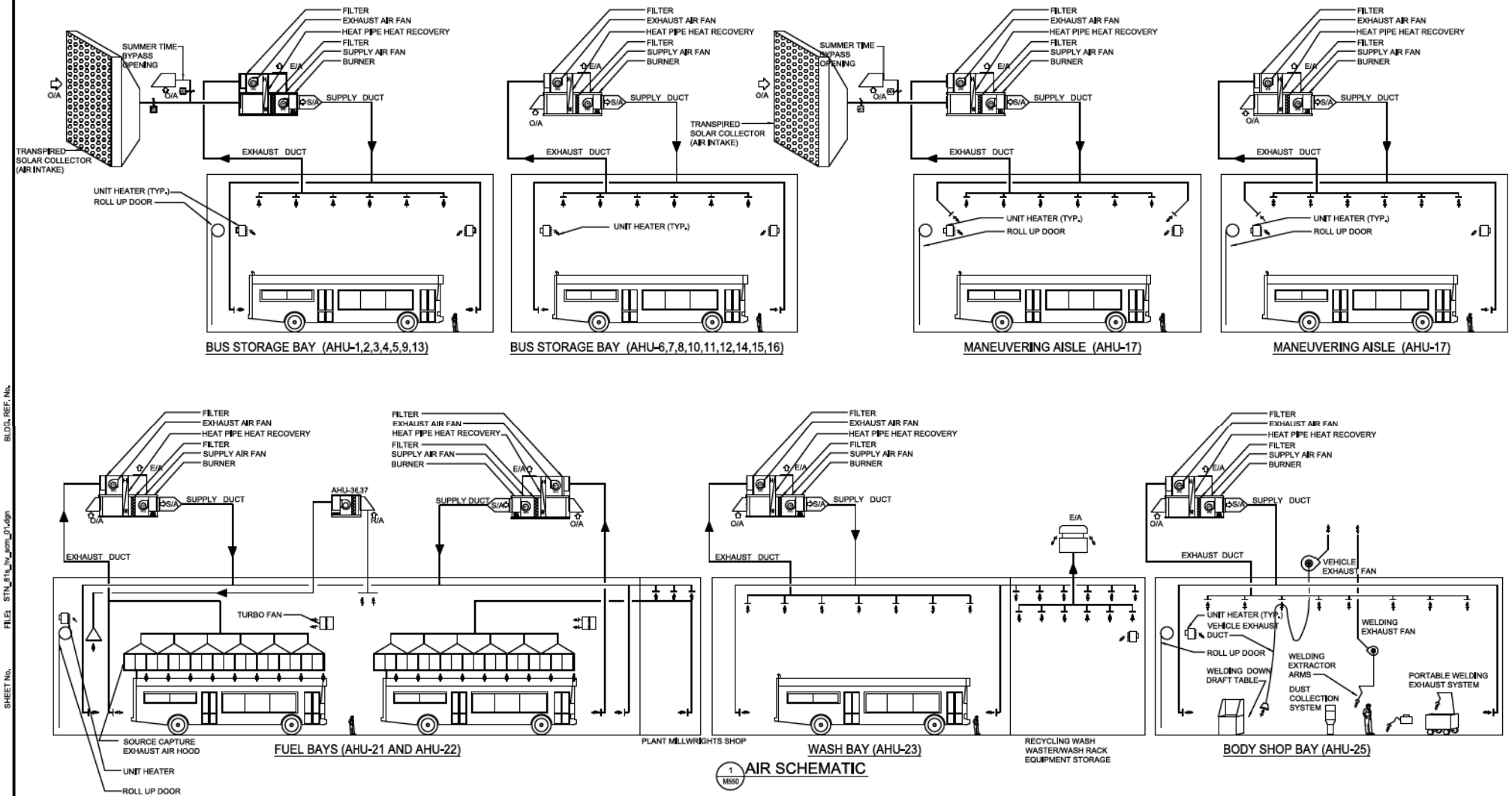
		SCALE(S)						



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REVISIONS	REVISIONS						
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		SCALE(S)					

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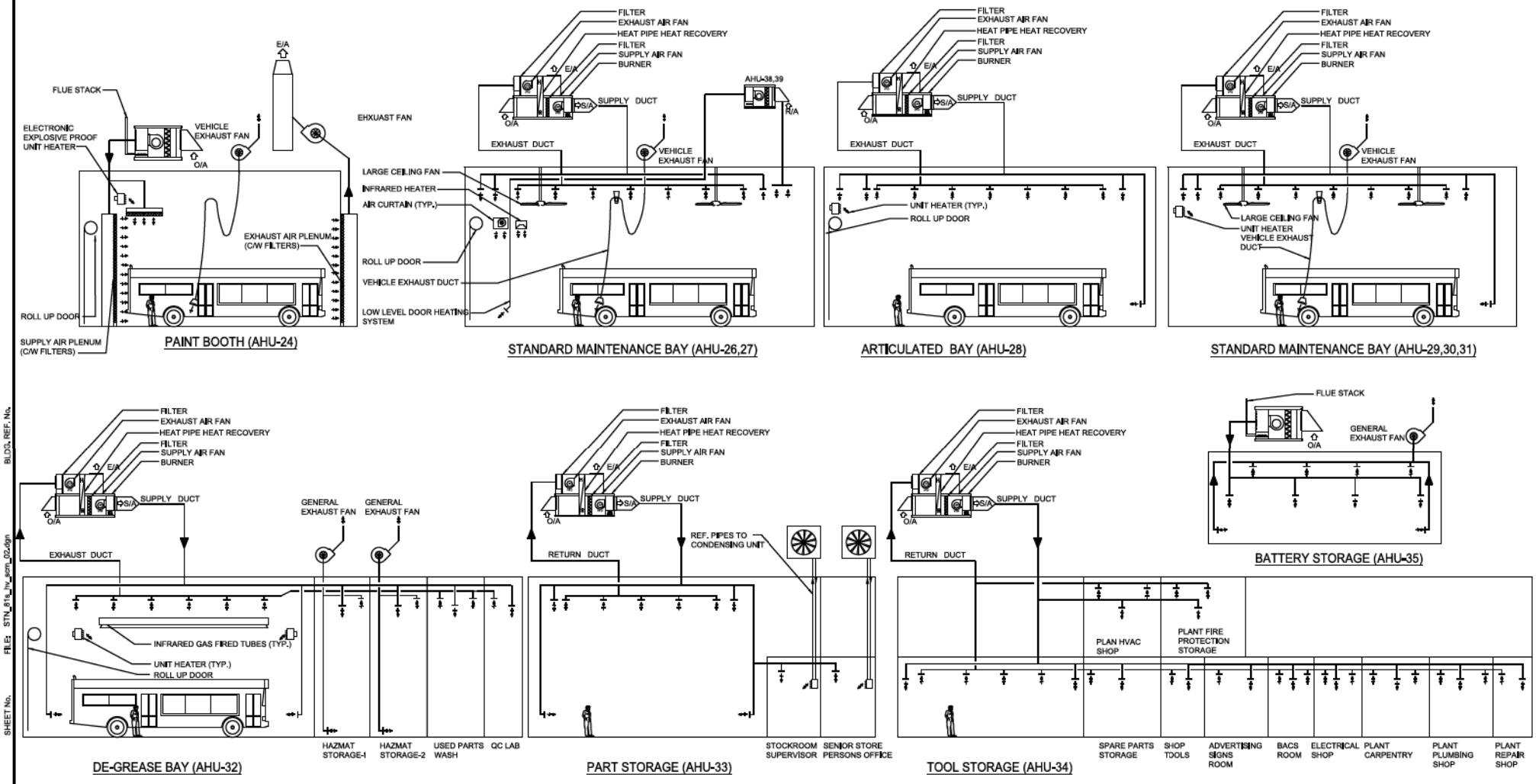

1 M551 AIR SCHEMATIC

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DRAWING No.: G85-314-M551

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S)

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
APPROVED

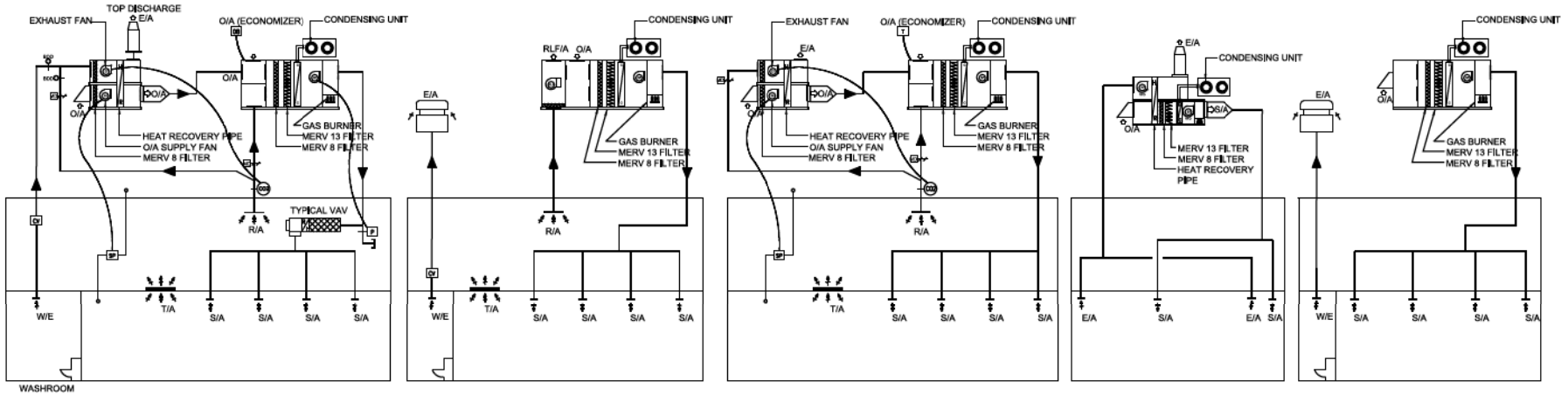
McNICOLL BUS GARAGE

H.V.A.C
AIR SCHEMATICS

Plot Date: 06-24-2014

Dwg. No. G85-314-M551

Sheet No.



OFFICE (AC-AHU-1,3,6) | CIS OFFICE (AC-AHU-2) | MAINTENANCE LUNCH ROOM (AC-AHU-4) | LOCKER ROOM (TYP. AC-AHU-5) | SOUTHEAST OFFICE (AC-AHU-7)

1 M552 AIR SCHEMATIC

BLDG. REF. No.
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SHEET No.
DRAWING No.: G85-314-M552

REVISIONS	REVISIONS							
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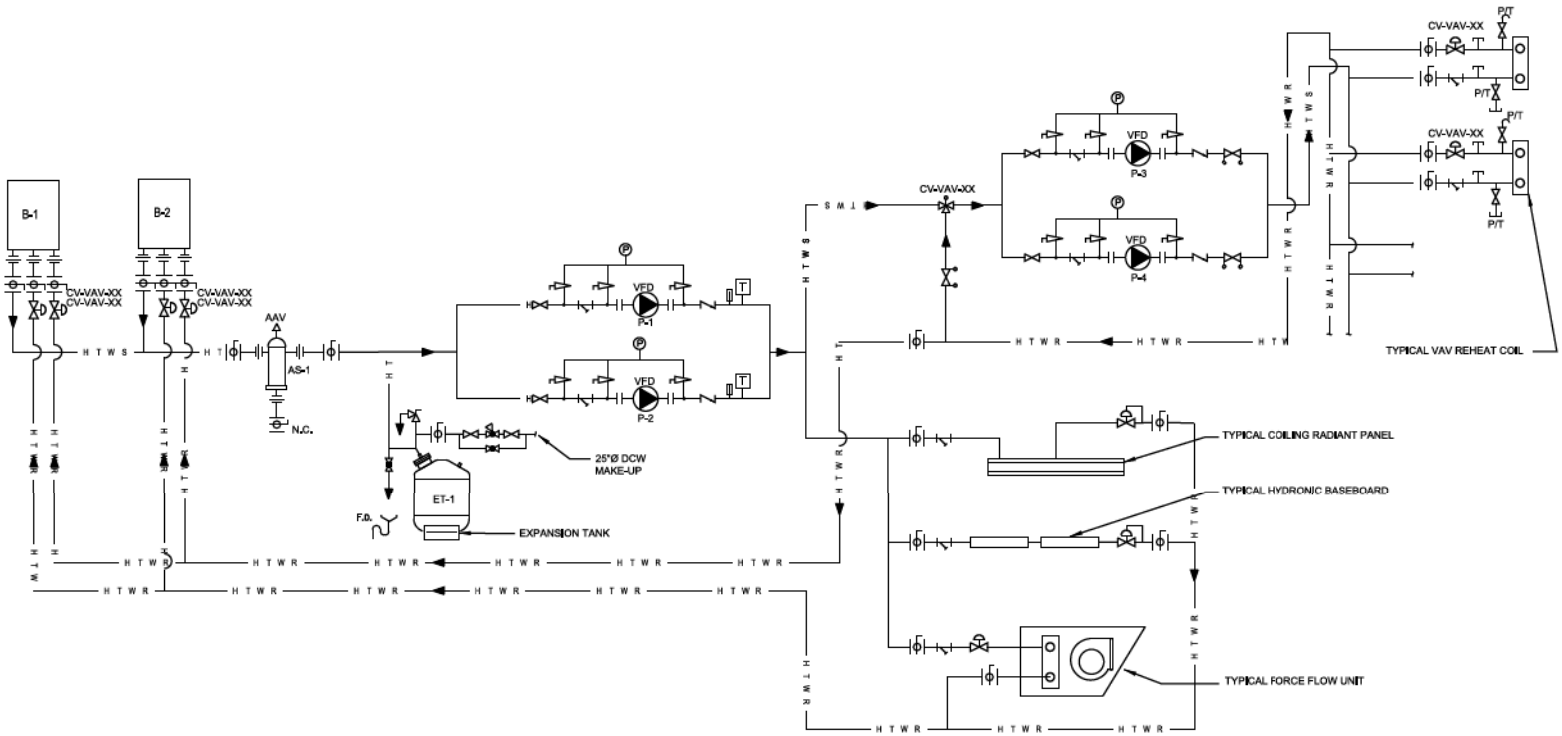
		SCALE(S)						



1 / M553 OFFICE AREA HYDRONIC HEATING SCHEMATIC

BLDG. REF. No.
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DRAWING No.: G85-314-M553

REVISIONS	REVISIONS						
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		SCALE(S)					

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Appendix C

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Table C.1: Detailed Noise Source Data

TTC McNicoll Bus Garage, Toronto, Ontario

Source ID	Source Description	Recommended Noise Control Measures	Source Sound Power Level Data 1/1 Octave Bands (dB)								PWL (dBA)	Source Location Information				Modelled Source Operations Minutes per Hour		
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz		X (m)	Y (m)	Z (m)	Source Height H (m) + Notes	Day	3am	6am
AHU1_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	83	75	71	68	88	17636802.7	4852572.0	15.0	4.0 m Above Roof	15	60	15
AHU1_OA	Air-Handling Unit - Outdoor Air Inlet	Relocate, remove, or silence north/west solar collector intakes	76	83	85	88	78	75	70	65	87	17636811.2	4852559.9	10.0	10.0 m Relative to Ground	15	60	15
AHU2_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	83	75	71	68	88	17636824.6	4852579.7	15.0	4.0 m Above Roof	15	60	15
AHU2_OA	Air-Handling Unit - Outdoor Air Inlet	Relocate, remove, or silence north/west solar collector intakes	76	83	85	88	78	75	70	65	87	17636833.2	4852567.7	10.0	10.0 m Relative to Ground	15	60	15
AHU3_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	83	75	71	68	88	17636846.7	4852587.5	15.0	4.0 m Above Roof	15	60	15
AHU3_OA	Air-Handling Unit - Outdoor Air Inlet	Relocate, remove, or silence north/west solar collector intakes	76	83	85	88	78	75	70	65	87	17636855.2	4852575.4	10.0	10.0 m Relative to Ground	15	60	15
AHU4_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	85	79	92	92	84	80	73	64	91	17636868.9	4852595.4	15.0	4.0 m Above Roof	15	60	15
AHU4_OA	Air-Handling Unit - Outdoor Air Inlet	Relocate, remove, or silence north/west solar collector intakes	72	86	85	86	75	71	66	63	85	17636886.3	4852591.6	10.0	10.0 m Relative to Ground	15	60	15
AHU5_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	83	75	71	68	88	17636793.1	4852599.5	15.0	4.0 m Above Roof	15	60	15
AHU5_OA	Air-Handling Unit - Outdoor Air Inlet	Relocate, remove, or silence north/west solar collector intakes	67	78	80	87	78	75	70	65	86	17636783.9	4852589.2	10.0	10.0 m Relative to Ground	15	60	15
AHU6_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	93	88	94	91	81	78	73	67	91	17636815.1	4852607.0	15.0	4.0 m Above Roof	15	60	15
AHU6_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	93	88	94	91	81	78	73	67	91	17636818.7	4852607.1	12.0	12.0 m Relative to Ground	15	60	15
AHU7_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	83	75	71	68	88	17636837.1	4852615.1	15.0	4.0 m Above Roof	15	60	15
AHU7_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	93	88	94	91	81	78	73	67	91	17636840.7	4852615.0	12.0	12.0 m Relative to Ground	15	60	15
AHU8_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	85	79	92	92	84	80	73	64	91	17636859.0	4852623.5	15.0	4.0 m Above Roof	15	60	15
AHU8_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	89	91	94	89	78	74	69	65	89	17636862.2	4852623.4	12.0	12.0 m Relative to Ground	15	60	15
AHU9_OA	Air-Handling Unit - Outdoor Air Inlet	Relocate, remove, or silence north/west solar collector intakes	67	78	80	87	78	75	70	65	86	17636773.6	4852618.5	10.0	10.0 m Relative to Ground	15	60	15
AHU10_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	83	75	71	68	88	17636804.7	4852636.3	15.0	4.0 m Above Roof	15	60	15
AHU10_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	93	88	94	91	81	78	73	67	91	17636808.0	4852636.2	12.0	12.0 m Relative to Ground	15	60	15
AHU11_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	83	75	71	68	88	17636826.8	4852644.1	15.0	4.0 m Above Roof	15	60	15
AHU11_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	93	88	94	91	81	78	73	67	91	17636830.1	4852644.1	12.0	12.0 m Relative to Ground	15	60	15
AHU12_EA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	85	79	92	92	84	80	73	64	91	17636852.3	4852652.7	12.0	12.0 m Relative to Ground	15	60	15
AHU12_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	85	79	92	92	84	80	73	64	91	17636848.6	4852652.9	15.0	4.0 m Above Roof	15	60	15
AHU13_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	83	75	71	68	88	17636772.5	4852657.8	15.0	4.0 m Above Roof	15	60	15
AHU13_OA	Air-Handling Unit - Outdoor Air Inlet	Relocate, remove, or silence north/west solar collector intakes	67	78	80	87	78	75	70	65	86	17636763.2	4852647.9	10.0	10.0 m Relative to Ground	15	60	15
AHU14_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	83	75	71	68	88	17636794.4	4852665.5	15.0	4.0 m Above Roof	15	60	15
AHU14_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	93	88	94	91	81	78	73	67	91	17636797.4	4852665.3	12.0	12.0 m Relative to Ground	15	60	15
AHU15_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	83	75	71	68	88	17636816.5	4852673.3	15.0	4.0 m Above Roof	15	60	15
AHU15_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	93	88	94	91	81	78	73	67	91	17636819.6	4852673.2	12.0	12.0 m Relative to Ground	15	60	15
AHU16_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	85	79	92	92	84	80	73	64	91	17636838.2	4852682.0	15.0	4.0 m Above Roof	15	60	15
AHU16_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	89	91	94	89	78	74	69	65	89	17636841.8	4852681.9	12.0	12.0 m Relative to Ground	15	60	15
AHU17_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	85	80	92	95	86	81	75	66	94	17636760.5	4852695.9	15.0	4.0 m Above Roof	15	60	15
AHU17_OA	Air-Handling Unit - Outdoor Air Inlet	Relocate, remove, or silence north/west solar collector intakes	73	88	84	81	75	71	66	62	82	17636749.2	4852687.4	10.0	10.0 m Relative to Ground	15	60	15
AHU18_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	85	80	92	95	86	81	75	66	94	17636784.1	4852704.2	15.0	4.0 m Above Roof	15	60	15
AHU18_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	90	93	93	84	78	74	69	64	87	17636784.4	4852699.9	12.0	12.0 m Relative to Ground	15	60	15
AHU19_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	85	80	92	95	86	81	75	66	94	17636811.5	4852713.9	15.0	4.0 m Above Roof	15	60	15
AHU19_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	90	93	93	84	78	74	69	64	87	17636811.6	4852709.4	12.0	12.0 m Relative to Ground	15	60	15
AHU20_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	85	80	92	95	86	81	75	66	94	17636840.7	4852724.3	15.0	4.0 m Above Roof	15	60	15
AHU20_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	90	93	93	84	78	74	69	64	87	17636840.9	4852719.7	12.0	12.0 m Relative to Ground	15	60	15
AHU21_EA	Air-Handling Unit - Exhaust Air Louvre		85	75	88	88	84	80	74	67	89	17636871.2	4852654.8	15.0	4.0 m Above Roof	15	60	15
AHU21_OA	Air-Handling Unit - Outdoor Air Inlet		90	91	95	90	79	74	70	65	90	17636867.2	4852654.7	12.0	12.0 m Relative to Ground	15	60	15
AHU22_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	85	75	88	88	84	80	74	67	89	17636875.8	4852656.5	15.0	4.0 m Above Roof	15	60	15
AHU22_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	90	91	95	90	79	74	70	65	90	17636879.1	4852658.9	12.0	12.0 m Relative to Ground	15	60	15
AHU23_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	89	87	88	85	83	77	70	64	87	17636856.0	4852696.5	15.0	4.0 m Above Roof	15	60	15
AHU23_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	100	97	93	86	82	79	74	68	90	17636860.1	4852699.1	12.0	12.0 m Relative to Ground	15	60	15
AHU24_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	92	97	97	88	82	78	73	67	91	17636825.8	4852806.1	12.0	12.0 m Relative to Ground	15	60	15
AHU25_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	83	81	89	86	81	73	69	66	87	17636809.1	4852791.2	15.0	4.0 m Above Roof	15	60	15
AHU25_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	93	86	93	90	80	76	71	65	90	17636806.7	4852794.5	12.0	12.0 m Relative to Ground	15	60	15
AHU26_EA	Air-Handling Unit - Exhaust Air Louvre		85	80	92	94	85	81	74	65	93	17636785.8	4852787.5	15.0	4.0 m Above Roof	15	60	15
AHU26_OA	Air-Handling Unit - Outdoor Air Inlet		90	92	92	83	77	74	68	63	87	17636788.4	4852784.1	12.0	12.0 m Relative to Ground	15	60	15
AHU27_EA	Air-Handling Unit - Exhaust Air Louvre		86	80	87	87	86	78	73	68	89	17636758.5	4852777.8	15.0	4.0 m Above Roof	15	60	15
AHU27_OA	Air-Handling Unit - Outdoor Air Inlet		88	90	92	86	76	72	67	63	87	17636760.9	4852774.5	12.0	12.0 m Relative to Ground	15	60	15
AHU28_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	81	89	87	82	74	70	67	87	17636725.2	4852769.1	15.0	4.0 m Above Roof	15	60	15
AHU28_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	93	88	94	91	81	78	73	67	91	17636721.3	4852769.6	12.0	12.0 m Relative to Ground	15	60	15
AHU29_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	79	93	92	84	80	73	64	92	17636760.3	4852750.8	15.0	4.0 m Above Roof	15	60	15
AHU29_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	89	91	94	89	78	74	69	64	89	17636757.9	4852754.3	12.0	12.0 m Relative to Ground	15	60	15
AHU30_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	79	93	92	84	80	73	64	92	17636784.7	4852759.5	15.0	4.0 m Above Roof	15	60	15
AHU30_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	89	91	94	89	78	74	69	64	89	17636782.4	4852762.9	12.0	12.0 m Relative to Ground	15	60	15
AHU31_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	84	79	93	92	84	79	72	63	92	17636815.5	4852770.3	15.0	4.0 m Above Roof	15	60	15
AHU31_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	89	91	93	88	77	73	68	64	88	17636813.1	4852773.7	12.0	12.0 m Relative to Ground	15	60	15
AHU32_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	77	68	85	83	80	77	74	67	85	17636836.0	4852764.0	15.0	4.0 m Above Roof	15	60	15
AHU32_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	91	85	89	87	81	76	73	69	88	17636833.6	4852766.9	12.0	12.0 m Relative to Ground	15	60	15
AHU33_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	76	68	82	79	77	73	68	61	82	17636813.0	4852739.0	15.0	4.0 m Above Roof	15	60	15

Source ID	Source Description	Recommended Noise Control Measures	Source Sound Power Level Data 1/1 Octave Bands (dB)								PWL (dBA)	Source Location Information				Modelled Source Operations Minutes per Hour		
			63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz		X (m)	Y (m)	Z (m)	Source Height H (m) + Notes	Day	3am	6am
AHU33_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	86	78	87	85	83	81	75	69	88	17636811.0	4852741.1	12.0	12.0 m Relative to Ground	15	60	15
AHU34_EA	Air-Handling Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	77	71	80	80	75	71	67	63	81	17636814.9	4852746.9	15.0	4.0 m Above Roof	15	60	15
AHU34_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	92	86	88	87	80	76	72	68	87	17636815.1	4852749.9	12.0	12.0 m Relative to Ground	15	60	15
AHU35_OA	Air-Handling Unit - Outdoor Air Inlet	Rotate such that louvres are north and/or east	71	66	74	74	70	66	62	60	75	17636773.4	4852742.0	12.0	12.0 m Relative to Ground	15	60	15
BD_repair_1	Bay Door - Repair Bay	Keep closed at night	90	88	86	87	90	90	86	86	95	17636727.4	4852744.7	2.0	2.0 m Relative to Ground	15	60	15
BD_repair_2	Bay Door - Repair Bay	Keep closed at night	90	88	86	87	90	90	86	86	95	17636721.9	4852747.3	2.0	2.0 m Relative to Ground	15	60	15
BD_repair_3	Bay Door - Repair Bay	Keep closed at night	90	88	86	87	90	90	86	86	95	17636718.4	4852756.1	2.0	2.0 m Relative to Ground	15	60	15
BD_repair_4	Bay Door - Repair Bay	Keep closed at night	90	88	86	87	90	90	86	86	95	17636715.4	4852765.8	2.0	2.0 m Relative to Ground	15	60	15
BD_repair_5	Bay Door - Repair Bay		104	98	97	96	95	93	90	86	100	17636847.2	4852788.8	2.0	2.0 m Relative to Ground	15	60	15
BD_storage_1	Bay Door - Storage Bay		101	95	94	93	92	90	87	83	97	17636808.5	4852558.9	2.0	2.0 m Relative to Ground	15	60	15
BD_storage_2	Bay Door - Storage Bay		101	95	94	93	92	90	87	83	97	17636829.8	4852566.5	2.0	2.0 m Relative to Ground	15	60	15
BD_storage_3	Bay Door - Storage Bay		101	95	94	93	92	90	87	83	97	17636851.5	4852574.1	2.0	2.0 m Relative to Ground	15	60	15
BD_storage_4	Bay Door - Storage Bay		101	95	94	93	92	90	87	83	97	17636875.8	4852582.7	2.0	2.0 m Relative to Ground	15	60	15
BD_wash	Bay Door - Wash Bay		95	92	88	87	86	89	85	85	94	17636883.3	4852628.3	2.0	2.0 m Relative to Ground	15	60	15
DX_AHU_1	Cooling Unit		99	95	91	89	88	85	82	79	93	17636767.1	4852719.2	12.0	1.0 m Above Roof	60	30	30
DX_AHU_2	Cooling Unit		98	94	90	88	86	83	81	77	91	17636763.3	4852726.0	12.0	1.0 m Above Roof	60	30	30
DX_AHU_3	Cooling Unit		98	94	90	88	86	83	81	77	91	17636747.0	4852719.9	12.0	1.0 m Above Roof	60	30	30
DX_AHU_4	Cooling Unit		99	95	91	89	88	85	82	79	93	17636774.4	4852734.7	12.0	1.0 m Above Roof	60	30	30
DX_AHU_5	Cooling Unit		99	95	91	89	88	85	82	79	93	17636747.9	4852728.0	12.0	1.0 m Above Roof	60	30	30
DX_AHU_6	Cooling Unit		100	96	92	90	89	86	83	80	94	17636777.0	4852721.6	12.0	1.0 m Above Roof	60	30	30
DX_AHU_7	Cooling Unit		98	94	90	88	86	83	81	77	91	17636882.3	4852668.1	7.6	1.0 m Above Roof	60	30	30
EF01	Exhaust Fan - Outlet		101	97	92	89	82	79	77	74	90	17636770.4	4852783.5	14.5	3.5 m Above Roof	15	60	15
EF01_cas	Exhaust Fan - Casing		101	97	87	79	67	59	55	49	84	17636770.0	4852784.4	12.0	1.0 m Above Roof	15	60	15
EF02	Exhaust Fan - Outlet		101	97	92	89	82	79	77	74	90	17636797.5	4852793.3	14.5	3.5 m Above Roof	15	60	15
EF02_cas	Exhaust Fan - Casing		101	97	87	79	67	59	55	49	84	17636797.2	4852794.1	12.0	1.0 m Above Roof	15	60	15
EF04	Exhaust Fan - Outlet		101	97	92	89	82	79	77	74	90	17636806.7	4852760.8	14.5	3.5 m Above Roof	15	60	15
EF04_cas	Exhaust Fan - Casing		101	97	87	79	67	59	55	49	84	17636807.4	4852761.1	12.0	1.0 m Above Roof	15	60	15
EF05	Exhaust Fan - Outlet		99	95	90	87	80	77	75	72	88	17636779.2	4852751.2	14.5	3.5 m Above Roof	15	60	15
EF05_cas	Exhaust Fan - Casing		99	95	85	77	65	57	53	47	82	17636780.0	4852751.4	12.0	1.0 m Above Roof	15	60	15
EF06	Exhaust Fan - Outlet		104	100	95	92	85	82	80	77	93	17636833.8	4852784.9	18.5	7.5 m Above Roof	15	60	15
EF06_cas	Exhaust Fan - Casing		104	100	90	82	70	62	58	52	87	17636835.9	4852785.7	12.0	1.0 m Above Roof	15	60	15
EF18	Exhaust Fan - Outlet		85	81	76	73	66	63	61	58	74	17636869.4	4852709.6	10.1	3.5 m Above Roof	15	60	15
SF6	Exhaust Fan - Outlet		85	81	76	73	66	63	61	58	74	17636871.0	4852704.9	10.1	3.5 m Above Roof	15	60	15
HRU1_EA	Heat Recovery Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	78	69	80	81	78	75	68	61	83	17636763.5	4852713.2	13.7	2.7 m Above Roof	60	30	30
HRU1_OA	Heat Recovery Unit - Outdoor Air Louvre	Rotate such that louvres are north and/or east	84	79	88	90	80	78	77	72	89	17636762.5	4852714.0	11.6	0.6 m Above Roof	60	30	30
HRU3_EA	Heat Recovery Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	74	64	74	80	76	74	70	66	81	17636743.3	4852714.7	13.5	2.5 m Above Roof	60	30	30
HRU3_OA	Heat Recovery Unit - Outdoor Air Louvre	Rotate such that louvres are north and/or east	69	64	72	75	66	64	63	60	74	17636742.3	4852715.5	11.6	0.6 m Above Roof	60	30	30
HRU4_EA	Heat Recovery Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	77	70	84	80	78	74	68	61	83	17636770.3	4852728.8	13.9	2.9 m Above Roof	60	30	30
HRU4_OA	Heat Recovery Unit - Outdoor Air Louvre	Rotate such that louvres are north and/or east	81	77	90	84	79	76	72	66	86	17636769.3	4852729.6	11.6	0.6 m Above Roof	60	30	30
HRU5_EA	Heat Recovery Unit - Exhaust Air Louvre		73	68	78	74	73	68	62	60	77	17636748.6	4852733.9	14.0	3.0 m Above Roof	60	30	30
HRU5_OA	Heat Recovery Unit - Outdoor Air Louvre		80	74	91	87	78	76	73	68	87	17636749.8	4852734.0	11.7	0.7 m Above Roof	60	30	30
HRU6_EA	Heat Recovery Unit - Exhaust Air Louvre	Rotate such that louvres are north and/or east	80	71	89	89	84	81	78	72	90	17636773.2	4852716.6	14.2	3.2 m Above Roof	60	30	30
HRU6_OA	Heat Recovery Unit - Outdoor Air Louvre	Rotate such that louvres are north and/or east	81	83	87	79	74	72	67	62	82	17636772.0	4852717.5	11.8	0.8 m Above Roof	60	30	30
refuel	Refuelling		103	98	95	95	97	94	88	81	101	17636885.7	4852680.9	3.0	3.0 m Relative to Ground		60	
generator	Standby Generator		118	116	110	105	101	100	99	96	109	17636836.0	4852856.3	2.0	2.0 m Relative to Ground	60		

SOUND POWER LEVELS

Sound calculations are based on ASHRAE equations for attenuation of sound from lined plenums. To match actual test data, adjustments are made in the lower bands to account for sound reflection by the plenums.

Haakon casing sound absorption coefficients and transmission loss values used in the calculations have been obtained by an independent sound testing laboratory. The fan sound data is based on AMCA 300 testing.

UNIT	OPEN	SOUND POWER LEVELS (db)								
		BAND	1	2	3	4	5	6	7	8
		FREQ	63	125	250	500	1000	2000	4000	8000
5-7,9-11,13-15	SA		95	90	91	86	82	77	72	66
5-7,9-11,13-15	RA		87	91	101	88	83	78	74	70
5-7,9-11,13-15	EA LV		84	81	89	87	83	75	71	68
5-7,9-11,13-15	OA		93	88	94	91	81	78	73	67
AHU-1-3	SA		95	90	91	86	81	77	72	66
AHU-1-3	RA		87	91	101	88	83	78	74	70
AHU-1-3	EA LV		84	81	89	87	83	75	71	68
AHU-1-3	OA		93	88	94	91	81	78	73	67
AHU-17-20	SA		94	91	90	82	79	76	71	64
AHU-17-20	RA		89	93	100	101	87	83	78	72
AHU-17-20	EA LV		85	80	92	95	86	81	75	66
AHU-17-20	OA		90	93	93	84	78	74	69	64
AHU-21,22	SA		95	90	92	85	80	76	72	66
AHU-21,22	RA		90	89	94	95	84	82	76	70
AHU-21,22	EA LV		85	75	88	88	84	80	74	67
AHU-21,22	OA		90	91	95	90	79	74	70	65
AHU-23	SA		101	98	92	87	83	78	73	67
AHU-23	RA		94	102	97	87	86	81	73	69
AHU-23	EA LV		89	87	88	85	83	77	70	64
AHU-23	OA		100	97	93	86	82	79	74	68
AHU-24	SA		94	91	91	83	81	78	73	66
AHU-24	OA		92	97	97	88	82	78	73	67
AHU-25	SA		94	89	90	85	80	75	70	64
AHU-25	RA		87	92	100	86	82	77	73	70
AHU-25	EA LV		83	81	89	86	81	73	69	66
AHU-25	OA		93	86	93	90	80	76	71	65
AHU-26	SA		93	90	89	81	78	75	70	64
AHU-26	RA		89	93	100	101	86	83	77	71
AHU-26	EA LV		85	80	92	94	85	81	74	65
AHU-26	OA		90	92	92	83	77	74	68	63
AHU-27	SA		92	88	89	81	78	75	70	64
AHU-27	RA		90	89	95	89	85	80	76	72
AHU-27	EA LV		86	80	87	87	86	78	73	68
AHU-27	OA		88	90	92	86	76	72	67	63
AHU-28	SA		95	90	91	86	81	77	72	66
AHU-28	RA		87	91	101	88	83	78	74	71
AHU-28	EA LV		84	81	89	87	82	74	70	67
AHU-28	OA		93	88	94	91	81	78	73	67
AHU-29,30	SA		94	89	92	84	80	76	72	65
AHU-29,30	RA		89	92	99	98	85	82	76	70
AHU-29,30	EA LV		84	79	93	92	84	80	73	64

PROJECT: MBG - TORONTO TRANSIT CENTER

DRAWN BY	TN	JOB NO.	49446	DWG NO.	49446DT01
DATE	2014-10-03	UNITS	IMPERIAL	REVISION	

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8

SOUND POWER LEVELS

Sound calculations are based on ASHRAE equations for attenuation of sound from lined plenums. To match actual test data, adjustments are made in the lower bands to account for sound reflection by the plenums.

Haakon casing sound absorption coefficients and transmission loss values used in the calculations have been obtained by an independent sound testing laboratory. The fan sound data is based on AMCA 300 testing.

UNIT	OPEN	SOUND POWER LEVELS (db)								
		BAND	1	2	3	4	5	6	7	8
		FREQ	63	125	250	500	1000	2000	4000	8000
AHU-29,30	OA		89	91	94	89	78	74	69	64
AHU-31	SA		93	89	90	83	79	76	71	65
AHU-31	RA		89	92	99	98	85	81	76	69
AHU-31	EA LV		84	79	93	92	84	79	72	63
AHU-31	OA		89	91	93	88	77	73	68	64
AHU-32	SA		93	86	87	84	79	76	72	68
AHU-32	RA		85	80	93	91	83	80	78	71
AHU-32	EA LV		77	68	85	83	80	77	74	67
AHU-32	OA		91	85	89	87	81	76	73	69
AHU-33	SA		90	81	86	85	82	80	73	67
AHU-33	RA		82	81	93	86	79	77	73	67
AHU-33	EA LV		76	68	82	79	77	73	68	61
AHU-33	OA		86	78	87	85	83	81	75	69
AHU-34	SA		94	87	86	82	78	74	70	66
AHU-34	RA		84	83	91	86	77	74	70	65
AHU-34	EA LV		77	71	80	80	75	71	67	63
AHU-34	OA		92	86	88	87	80	76	72	68
AHU-35	SA		74	66	69	69	65	62	60	60
AHU-35	OA		71	66	74	74	70	66	62	60
AHU-4	SA		93	89	91	84	80	76	72	66
AHU-4	RA		89	93	99	98	85	82	76	70
AHU-4	EA LV		85	79	92	92	84	80	73	64
AHU-4	OA		89	91	94	89	78	74	69	65
AHU-8,12,16	SA		93	89	91	83	80	76	72	66
AHU-8,12,16	RA		89	93	99	98	85	82	76	70
AHU-8,12,16	EA LV		85	79	92	92	84	80	73	64
AHU-8,12,16	OA		89	91	94	89	78	74	69	65
HRU-1	SA		85	80	87	88	83	81	78	74
HRU-1	RA		81	79	88	87	81	78	72	65
HRU-1	EA LV		78	69	80	81	78	75	68	61
HRU-1	OA		84	79	88	90	80	78	77	72
HRU-3	SA		75	69	74	78	71	69	66	61
HRU-3	RA		79	76	82	86	77	75	73	69
HRU-3	EA LV		74	64	74	80	76	74	70	66
HRU-3	OA		69	64	72	75	66	64	63	60
HRU-4	SA		82	77	88	84	80	77	72	65
HRU-4	RA		82	81	92	86	80	78	73	66
HRU-4	EA LV		77	70	84	80	78	74	68	61
HRU-4	OA		81	77	90	84	79	76	72	66
HRU-5	SA		76	68	83	80	76	73	68	62

PROJECT: MBG - TORONTO TRANSIT CENTER

DRAWN BY	TN	JOB NO.	49446	DWG NO.	49446DT02
DATE	2014-10-03	UNITS	IMPERIAL	REVISION	

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8

SOUND POWER LEVELS

Sound calculations are based on ASHRAE equations for attenuation of sound from lined plenums. To match actual test data, adjustments are made in the lower bands to account for sound reflection by the plenums.

Haakon casing sound absorption coefficients and transmission loss values used in the calculations have been obtained by an independent sound testing laboratory. The fan sound data is based on AMCA 300 testing.

UNIT	OPEN	SOUND POWER LEVELS (db)									
		BAND	1	2	3	4	5	6	7	8	
		FREQ	63	125	250	500	1000	2000	4000	8000	
HRU-5	RA		79	79	90	80	75	74	69	63	
HRU-5	EA LV		73	68	78	74	73	68	62	60	
HRU-5	OA		80	74	91	87	78	76	73	68	
HRU-6	RA		87	83	96	95	87	84	82	76	
HRU-6	SA		83	83	86	80	78	75	70	62	
HRU-6	EA LV		80	71	89	89	84	81	78	72	
HRU-6	OA		81	83	87	79	74	72	67	62	

PROJECT: MBG - TORONTO TRANSIT CENTER

DRAWN BY	TN	JOB NO.	49446	DWG NO.	49446DT03
DATE	2014-10-03	UNITS	IMPERIAL	REVISION	

HAAKON INDUSTRIES
11851 DYKE ROAD, RICHMOND, B.C. CANADA V7A 4X8

ASHRAE 1991 Fan PWL Estimation - SF-6, EF-18

Select Fan Type From List:

Fan type 3 Centrifugal Forward Curved Blade, All Sizes

1	Centrifugal Airfoil, Backward Curved or Inclined Blade, Over 30 in dia. (0.76 m)
2	Centrifugal Airfoil, Backward Curved or Inclined Blade, Under 30 in dia. (0.76 m)
3	Centrifugal Forward Curved Blade, All Sizes
4	Centrifugal Radial, Forward Curved, Over 40 in dia. (1.01 m)
5	Centrifugal Radial, Forward Curved, Under 40 in dia. (1.01 m)
6	Centrifugal Radial. Strraight Blade, Over 40 in dia. (1.01 m)
7	Centrifugal Radial. Strraight Blade, Between 20 and 40 in dia. (0.51 to 1.01 m)
8	Centrifugal Radial. Strraight Blade, Under 20 in dia. (0.51 m)
9	Tubeaxial (No Straitening Vanes), Over 40 in dia. (1.01 m)
10	Tubeaxial (No Straitening Vanes), Under 40 in dia. (1.01 m)
11	Vaneaxial, Over 40 in dia. (1.01 m)
12	Vaneaxial, Under 40 in dia. (1.01 m)
13	Propeller, All Sizes

UNITS **Imperial**

Fan Diameter		in	Peak Fan Efficiency (PE)		
Flow Rate	8495	cfm	Peak Static Efficiency (SE)		
Static Pressure	0.5	in w.g.	SE / PE Ratio	N/A	
RPM			Correction for Off-Peak	5.0	dB
No of Blades					
Blade Pass Freq (BPF)	500	Hz			
Blade Freq Incr (BFI)	2	dB			

	3	4	5	6	7	8	9	10
	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
K_W	50	46	41	36	31	28	26	23
10 log Q	39.3	39.3	39.3	39.3	39.3	39.3	39.3	39.3
20 log P	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9	-5.9
BFI	-	-	-	2	-	-	-	-
PE / SE	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
TOTAL PWL	**88**	**84**	**79**	**76**	**69**	**66**	**64**	**61**
Inlet PWL	**85**	**81**	**76**	**73**	**66**	**63**	**61**	**58**
Outlet PWL	**85**	**81**	**76**	**73**	**66**	**63**	**61**	**58**
Casing Loss	0	0	5	10	15	20	22	25

ASHRAE 1991 Fan PWL Estimation - EF-1,2,4

Select Fan Type From List:

Fan type 3 Centrifugal Forward Curved Blade, All Sizes

1	Centrifugal Airfoil, Backward Curved or Inclined Blade, Over 30 in dia. (0.76 m)
2	Centrifugal Airfoil, Backward Curved or Inclined Blade, Under 30 in dia. (0.76 m)
3	Centrifugal Forward Curved Blade, All Sizes
4	Centrifugal Radial, Forward Curved, Over 40 in dia. (1.01 m)
5	Centrifugal Radial, Forward Curved, Under 40 in dia. (1.01 m)
6	Centrifugal Radial. Strraight Blade, Over 40 in dia. (1.01 m)
7	Centrifugal Radial. Strraight Blade, Between 20 and 40 in dia. (0.51 to 1.01 m)
8	Centrifugal Radial. Strraight Blade, Under 20 in dia. (0.51 m)
9	Tubeaxial (No Straitening Vanes), Over 40 in dia. (1.01 m)
10	Tubeaxial (No Straitening Vanes), Under 40 in dia. (1.01 m)
11	Vaneaxial, Over 40 in dia. (1.01 m)
12	Vaneaxial, Under 40 in dia. (1.01 m)
13	Propeller, All Sizes

UNITS **Imperial**

Fan Diameter		in	Peak Fan Efficiency (PE)		
Flow Rate	3197	cfm	Peak Static Efficiency (SE)		
Static Pressure	4.8	in w.g.	SE / PE Ratio	N/A	
RPM			Correction for Off-Peak	5.0	dB
No of Blades					
Blade Pass Freq (BPF)	500	Hz			
Blade Freq Incr (BFI)	2	dB			

	3	4	5	6	7	8	9	10
	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
K_W	50	46	41	36	31	28	26	23
10 log Q	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
20 log P	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6
BFI	-	-	-	2	-	-	-	-
PE / SE	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
TOTAL PWL	**104**	**100**	**95**	**92**	**85**	**82**	**80**	**77**
Inlet PWL	**101**	**97**	**92**	**89**	**82**	**79**	**77**	**74**
Outlet PWL	**101**	**97**	**92**	**89**	**82**	**79**	**77**	**74**
Casing Loss	0	0	5	10	15	20	22	25

ASHRAE 1991 Fan PWL Estimation - EF-5

Select Fan Type From List:

Fan type 3 Centrifugal Forward Curved Blade, All Sizes

1	Centrifugal Airfoil, Backward Curved or Inclined Blade, Over 30 in dia. (0.76 m)
2	Centrifugal Airfoil, Backward Curved or Inclined Blade, Under 30 in dia. (0.76 m)
3	Centrifugal Forward Curved Blade, All Sizes
4	Centrifugal Radial, Forward Curved, Over 40 in dia. (1.01 m)
5	Centrifugal Radial, Forward Curved, Under 40 in dia. (1.01 m)
6	Centrifugal Radial. Strraight Blade, Over 40 in dia. (1.01 m)
7	Centrifugal Radial. Strraight Blade, Between 20 and 40 in dia. (0.51 to 1.01 m)
8	Centrifugal Radial. Strraight Blade, Under 20 in dia. (0.51 m)
9	Tubeaxial (No Straitening Vanes), Over 40 in dia. (1.01 m)
10	Tubeaxial (No Straitening Vanes), Under 40 in dia. (1.01 m)
11	Vaneaxial, Over 40 in dia. (1.01 m)
12	Vaneaxial, Under 40 in dia. (1.01 m)
13	Propeller, All Sizes

UNITS **Imperial**

Fan Diameter		in	Peak Fan Efficiency (PE)	
Flow Rate	2399	cfm	Peak Static Efficiency (SE)	
Static Pressure	4.8	in w.g.	SE / PE Ratio	N/A
RPM			Correction for Off-Peak	5.0 dB
No of Blades				
Blade Pass Freq (BPF)	500	Hz		
Blade Freq Incr (BFI)	2	dB		

	3	4	5	6	7	8	9	10
	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
K_W	50	46	41	36	31	28	26	23
10 log Q	33.8	33.8	33.8	33.8	33.8	33.8	33.8	33.8
20 log P	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6
BFI	-	-	-	2	-	-	-	-
PE / SE	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
TOTAL PWL	**102**	**98**	**93**	**90**	**83**	**80**	**78**	**75**
Inlet PWL	**99**	**95**	**90**	**87**	**80**	**77**	**75**	**72**
Outlet PWL	**99**	**95**	**90**	**87**	**80**	**77**	**75**	**72**
Casing Loss	0	0	5	10	15	20	22	25

ASHRAE 1991 Fan PWL Estimation - EF-6

Select Fan Type From List:

Fan type 3 Centrifugal Forward Curved Blade, All Sizes

1	Centrifugal Airfoil, Backward Curved or Inclined Blade, Over 30 in dia. (0.76 m)
2	Centrifugal Airfoil, Backward Curved or Inclined Blade, Under 30 in dia. (0.76 m)
3	Centrifugal Forward Curved Blade, All Sizes
4	Centrifugal Radial, Forward Curved, Over 40 in dia. (1.01 m)
5	Centrifugal Radial, Forward Curved, Under 40 in dia. (1.01 m)
6	Centrifugal Radial. Strraight Blade, Over 40 in dia. (1.01 m)
7	Centrifugal Radial. Strraight Blade, Between 20 and 40 in dia. (0.51 to 1.01 m)
8	Centrifugal Radial. Strraight Blade, Under 20 in dia. (0.51 m)
9	Tubeaxial (No Straitening Vanes), Over 40 in dia. (1.01 m)
10	Tubeaxial (No Straitening Vanes), Under 40 in dia. (1.01 m)
11	Vaneaxial, Over 40 in dia. (1.01 m)
12	Vaneaxial, Under 40 in dia. (1.01 m)
13	Propeller, All Sizes

UNITS **Imperial**

Fan Diameter		in	Peak Fan Efficiency (PE)	
Flow Rate	41977	cfm	Peak Static Efficiency (SE)	
Static Pressure	2.0	in w.g.	SE / PE Ratio	N/A
RPM			Correction for Off-Peak	5.0 dB
No of Blades				
Blade Pass Freq (BPF)	500	Hz		
Blade Freq Incr (BFI)	2	dB		

	3	4	5	6	7	8	9	10
	Octave Band Centre Frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
K_W	50	46	41	36	31	28	26	23
10 log Q	46.2	46.2	46.2	46.2	46.2	46.2	46.2	46.2
20 log P	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2
BFI	-	-	-	2	-	-	-	-
PE / SE	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
TOTAL PWL	**107**	**103**	**98**	**95**	**88**	**85**	**83**	**80**
Inlet PWL	**104**	**100**	**95**	**92**	**85**	**82**	**80**	**77**
Outlet PWL	**104**	**100**	**95**	**92**	**85**	**82**	**80**	**77**
Casing Loss	0	0	5	10	15	20	22	25

Table C.2: Bus Route Measurements and Calculations

Source ID	Source Description	Measurement Type	Partition Coefficient	Distance (m)	Spectrum Weighting	Measured Sound Pressure Levels (1/1 Octave Band Levels)									Total SPL (dBA)	Calculated Sound Power Levels (1/1 Octave Band Levels)									Total PWL (dBA)
						32	63	125	250	500	1000	2000	4000	8000		32	63	125	250	500	1000	2000	4000	8000	
M_28	bus passby, acceleration from stop	Spherical	50%	2.0	Flat	82.5	101.1	98.7	87.7	82.3	79.6	77.6	73.2	65.2	87.6		115.1	112.7	101.7	96.3	93.6	91.6	87.2	79.2	101.6
M_29	low speed bus passby	Spherical	50%	5.0	Flat	79.0	96.0	87.4	76.8	74.1	73.7	70.1	65.4	57.7	79.2	101.0	118.0	109.4	98.8	96.1	95.7	92.1	87.4	79.7	101.2
	average of low speed and accelerating															101.0	116.8	111.3	100.5	96.2	94.8	91.8	87.3	79.4	101.4
	per bus, per m																								
km/m	0.001																								
km/hr	20																								
total buses (bus / hr m)	**0.00005**																								
dB correction	**-43.0**																								
PWL / m / bus	average of low speed and accelerating, per bus, per metre															**58.0**	**73.8**	**68.3**	**57.5**	**53.2**	**51.7**	**48.8**	**44.3**	**36.4**	**58.4**

Bus Movement Summary

Bus Route	Bus Movements Per Hour		
	Daytime	3am Period	6am Period
Entrance	60	14	5
Exit	2	0	98

Table 4 Sound level data on general site activities

Ref No.	Equipment	Power rating kW	Equipment size, weight (mass), capacity	Octave Band Sound Pressure Levels (Hz)								A-weighted Sound Pressure Level, L_{Aeq} dB
				63	125	250	500	1k	2k	4k	8k	
Distribution of Materials												
1	**Articulated Dump Truck Ж**	194	25 t	90	87	77	79	75	73	67	63	**81 Ж**
2	**Articulated Dump Truck Ж**	187	23 t	85	80	77	72	74	70	65	58	**78 Ж**
3	**Dumper Ж**	81	7 t	84	81	74	73	72	68	61	53	**76 Ж**
4	**Dumper Ж**	75	9 t	82	76	75	74	68	68	64	55	**76 Ж**
5	**Dumper (Idling)**	75	9 t	73	64	55	55	60	56	50	43	**63**
6	**Dumper Ж**	60	6 t	89	86	77	74	72	72	66	62	**79 Ж**
7	**Dumper Ж**	56	5 t	90	86	72	71	71	71	66	59	**78 Ж**
8	**Dumper (Idling)**	56	5 t	68	56	47	49	52	50	41	32	**56**
9	**Dumper Ж**	32	3 t	82	82	78	77	69	67	61	53	**77 Ж**
10	**Wheeled Excavator**	90	18 t	64	60	63	64	62	57	51	45	**66**
11	**Wheeled Excavator (Idling)**	90	18 t	61	59	57	57	58	52	42	34	**61**
12	**Wheeled Excavator Ж**	63	14 t	84	82	77	75	72	68	60	52	**77 Ж**
13	**Wheeled Loader Ж**	75	37 t	83	72	70	69	65	64	57	49	**71 Ж**
14	**Wheeled Backhoe loader**	62	9 t	68	67	63	62	62	61	54	47	**67**
15	**Fuel Tanker Lorry Ж**	-	11 t	79	73	71	75	72	67	59	50	**76 Ж**
16	**Fuel Tanker Pumping**	-	25,000 litre	75	70	67	67	69	66	60	53	**72**
17	**Tracked Excavator**	41	8 t	81	72	68	68	66	64	60	55	**71**
Mixing Concrete												
18	**Cement Mixer Truck (Discharging)**	-	-	80	69	66	70	71	69	64	58	**75**
19	**Cement Mixer Truck (Idling)**	-	-	77	71	65	65	66	66	60	51	**71**
20	**Concrete Mixer Truck**	-	-	83	74	66	69	70	78	60	55	**80**
21	**Large Lorry Concrete Mixer**	216	-	80	71	65	72	71	72	68	56	**77**
22	**Large Concrete Mixer**	167	26 t	72	73	79	72	69	67	63	60	**76**
23	**Small Cement Mixer**	2	-	61	65	58	58	57	53	51	49	**61**
Pumping Concrete												
24	**Concrete Pump + Cement Mixer Truck (Discharging)**	223	8 t / 350 bar	69	64	64	66	63	59	53	47	**67**
25	**Concrete Pump + Concrete Mixer Truck (Pumping to 5th Floor)**	171	6 t / 350 bar / 150 mm diameter	83	81	78	79	77	74	71	66	**82**

Ж Drive-by maximum sound pressure level in L_{max} (Octave Bands) and L_{Amax} (Overall Level)

AIR HANDLING UNIT SCHEDULE

UNIT TAG	SERVICE	LOCATION	TOTAL AIRFLOW	O/A (MINIMUM)	O/A (%)	SUPPLY FAN										EXHAUST FAN										HEATING NG @ 35 Kpa				ELECTRIC			PHYSICAL DIMENSIONS					REMARKS
						FLOW	DRIVE	ESP	TSP	Fan RPM	MOTOR				ELECTRIC	FLOW	DRIVE	ESP	TSP	Fan RPM	MOTOR				ELECTRIC	TOTAL CAPACITY (INPUT)	TOTAL CAPACITY (OUTPUT)	EDB	LDB	POWER	CONVENIENCE CIRCUIT	LENGTH	WIDTH	HEIGHT	OPER. WEIGHT	
			L/s	L/s		L/s		Pa	Pa	RPM	BHP	HP	RPM	TYPE	V/PH/HZ	L/s		Pa	Pa	RPM	BHP	HP	RPM	TYPE	V/PH/HZ	KW	KW	°C	°C	V/PH/HZ	MCA V/PH/HZ	mm	mm	mm	kg	
AHU-1	STORAGE BAY 1	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	586.1	468.9			575/3/60		8,192	4,975	4,490	11,762	1,3,5,6,7,8
AHU-2	STORAGE BAY 2	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	586.1	468.9			575/3/60		8,192	4,975	4,490	11,762	1,3,5,6,7,8
AHU-3	STORAGE BAY 3	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	586.1	468.9			575/3/60		8,192	4,975	4,490	11,762	1,3,5,6,7,8
AHU-4	STORAGE BAY 4	ROOF	8,491	8,491	100%	8491	VFD	318	953	1369		20.0	1750		575/3/60	8491	VFD	318	889	1480		20	1750		575/3/60	677.8	542.2			575/3/60		8,496	5,461	4,683	13,467	1,3,5,6,7,8
AHU-5	STORAGE BAY 5	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	494.6	395.7			575/3/60		8,039	4,975	4,490	11,463	1,3,5,6,7,8
AHU-6	STORAGE BAY 6	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	494.6	395.7			575/3/60		8,039	4,975	4,490	11,463	1,3,5,6,7,8
AHU-7	STORAGE BAY 7	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	494.6	395.7			575/3/60		8,039	4,975	4,490	11,463	1,3,5,6,7,8
AHU-8	STORAGE BAY 8	ROOF	8,491	8,491	100%	8491	VFD	318	953	1369		20.0	1750		575/3/60	8491	VFD	318	889	1480		20	1750		575/3/60	586.1	468.9			575/3/60		8,293	5,461	4,683	13,064	1,3,5,6,7,8
AHU-9	STORAGE BAY 9	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	494.6	395.7			575/3/60		8,039	4,975	4,490	11,463	1,3,5,6,7,8
AHU-10	STORAGE BAY 10	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	494.6	395.7			575/3/60		8,039	4,975	4,490	11,463	1,3,5,6,7,8
AHU-11	STORAGE BAY 11	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	494.6	395.7			575/3/60		8,039	4,975	4,490	11,463	1,3,5,6,7,8
AHU-12	STORAGE BAY 12	ROOF	8,491	8,491	100%	8491	VFD	318	953	1369		20.0	1750		575/3/60	8491	VFD	318	889	1480		20	1750		575/3/60	586.1	468.9			575/3/60		8,293	5,461	4,683	13,064	1,3,5,6,7,8
AHU-13	STORAGE BAY 13	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	494.6	395.7			575/3/60		8,039	4,975	4,490	11,463	1,3,5,6,7,8
AHU-14	STORAGE BAY 14	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	494.6	395.7			575/3/60		8,039	4,975	4,490	11,463	1,3,5,6,7,8
AHU-15	STORAGE BAY 15	ROOF	7,075	7,075	100%	7075	VFD	318	953	1499		15.0	1750		575/3/60	7075	VFD	318	889	1677		20	1750		575/3/60	494.6	395.7			575/3/60		8,039	4,975	4,490	11,463	1,3,5,6,7,8
AHU-16	STORAGE BAY 16	ROOF	8,491	8,491	100%	8491	VFD	318	953	1369		20.0	1750		575/3/60	8491	VFD	318	889	1480		20	1750		575/3/60	586.1	468.9			575/3/60		8,293	5,461	4,683	13,064	1,3,5,6,7,8
AHU-17	MANEUVERING AISLE 1	ROOF	9,670	9,670	100%	9670	VFD	318	953	1190		20.0	1750		575/3/60	9670	VFD	318	889	1602		25	1750		575/3/60	732.8	586.2			575/3/60		8,649	5,537	4,810	14,432	1,3,5,6,7,8
AHU-18	MANEUVERING AISLE 2	ROOF	9,670	9,670	100%	9670	VFD	318	953	1190		20.0	1750		575/3/60	9670	VFD	318	889	1602		25	1750		575/3/60	659.4	527.5			575/3/60		8,649	5,537	4,810	14,432	1,3,5,6,7,8
AHU-19	MANEUVERING AISLE 3	ROOF	9,670	9,670	100%	9670	VFD	318	953	1190		20.0	1750		575/3/60	9670	VFD	318	889	1602		25	1750		575/3/60	659.4	527.5			575/3/60		8,649	5,537	4,810	14,432	1,3,5,6,7,8
AHU-20	MANEUVERING AISLE 4	ROOF	9,670	9,670	100%	9670	VFD	318	953	1190		20.0	1750		575/3/60	9670	VFD	318	889	1602		25	1750		575/3/60	732.8	586.2			575/3/60		8,649	5,537	4,810	14,432	1,3,5,6,7,8
AHU-21	FUEL BAY @ 75% - 1	ROOF	8,632	8,632	100%	8632	VFD	318	953	1379		20.0	1750		575/3/60	8632	VFD	318	889	1506		20	1750		575/3/60	512.9	410.3			575/3/60		8,141	5,220	4,682	12,661	1,3,5,6,7,8
AHU-22	FUEL BAY @ 75% - 2, MILLWEIGHT SHO	ROOF	8,632	8,632	100%	8632	VFD	318	953	1379		20.0	1750		575/3/60	8632	VFD	318	889	1506		20	1750		575/3/60	512.9	410.3			575/3/60		8,141	5,220	4,682	12,661	1,3,5,6,7,8
AHU-23	WASHBAY	ROOF	15,142	15,142	100%	15142	VFD	318	953	982		30.0	1750		575/3/60	15142	VFD	318	889	1070		40	1750		575/3/60	1025.8	820.6			575/3/60		9,938	6,213	5,817	20,141	1,3,5,6,7,8
AHU-24	TOUCH UP BAY	ROOF	19,811	19,811	100%	19811	VFD	381	889	1178		20.0	1750		575/3/60											1318.9	1055.1			575/3/60		9,626	4,575	1,988	11,037	1,5,6,7
AHU-25	BODY BAY	ROOF	6,651	6,651	100%	6651	VFD	318	953	146		15.0	1750		575/3/60	6651	VFD	318	889	1616		15	1750		575/3/60	531.3	425			575/3/60		8,039	5,077	4,389	11,277	1,3,5,6,7,8
AHU-26	ARTICULATED MAINT BAY 1	ROOF	9,340	9,340	100%	9340	VFD	318	953	1174		20.0	1750		575/3/60	9340	VFD	318	889	1567		25	1750		575/3/60	806.0	644.8			575/3/60		8,649	5,661	4,709	14,399	1,3,5,6,7,8
AHU-27	ARTICULATED PAINT BAY 2	ROOF	7,642	7,642	100%	7642	VFD	318	953	1309		15.0	1750		575/3/60	7642	VFD	318	889	1779		20	1750		575/3/60	622.8	498.2			575/3/60		8,192	5,191	4,491	12,209	1,3,5,6,7,8
AHU-28	ARTICULATED PAINT BAY 3	ROOF	7,170	7,170	100%	7170	VFD	318	953	1508		15.0	1750		575/3/60	7170	VFD	318	889	1691		20	1750		575/3/60	586.1	468.9			575/3/60		8,192	5,191	4,461	11,974	1,3,5,6,7,8
AHU-29	STANDARD MAINT BAY 1	ROOF	8,396	8,396	100%	8396	VFD	318	953	1362		20.0	1750		575/3/60	8396	VFD	318	889	1470		20	1750		575/3/60	659.4	527.5			575/3/60		8,293	5,182	4,681	12,841	1,3,5,6,7,8
AHU-30	STANDARD MAINT BAY 2	ROOF	8,396	8,396	100%	8396	VFD	318	953	1362		20.0	1750		575/3/60	8396	VFD	318	889	1470		20	1750		575/3/60	622.8	498.2			575/3/60		8,293	5,182	4,681	12,841	1,3,5,6,7,8
AHU-31	STANDARD MAINT BAY 3	ROOF	8,113	8,113	100%	8113	VFD	318	953	1342		15.0	1750		575/3/60	8113	VFD	318	889	1442		20	1750		575/3/60	630.1	504.1			575/3/60		8,293	5,131	4,681	12,727	1,3,5,6,7,8
AHU-32	DE GREASING BAY	ROOF	3,868	3,868	100%	3868	VFD	318	953	2007		10.0	1750		575/3/60	3868	VFD	318	889	2282		10	1750		575/3/60	300.4	240.3			575/3/60		7,867	3,823	3,793	8,292	1,3,5,6,7,8
AHU-33	PART STORAGE	ROOF	2,925	2,925	100%	2925	VFD	318	953	2346		7.5	1750		575/3/60	2925	VFD	318	889	1962		7.5	1730		575/3/60	113.6	90.9			575/3/60		6,797	3,454	3,744	5,764	1,3,5,6,7
AHU-34	TOOL STORAGE	ROOF	3,538	3,538	100%	3538	VFD	318	953	1936		7.5	1750		575/3/60	3538	VFD	318	889	1709		7.5	1730		575/3/60	131.9	105.5			575/3/60		6,867	3,496	3,815	6,276	1,3,5,6,7
AHU-35	BATTERY STORAGE	ROOF	613	613	100%	613	VFD	254	635	2807		1.0	1750		575/3/60											40.3	32.2			575/3/60		4,435	1,314	1,086	1,395	1,5,6,7
AHU-36	SOUTH BUS STORAGE ENTRANCE	ROOF	5,187	0	0%	5187	VFD	127							575/3/60											168.5	134.8			575/3/60						1,5,6,7
AHU-37	SOUTH BUS STORAGE ENTRANCE	ROOF	5,187	0	0%	5187	VFD	127							575/3/60											168.5	134.8			575/3/60						1,5,6,7
AHU-38	OVERHEAD DOOR ENTRANCE	ROOF	3,774	0	0%	3774	VFD	191							575/3/60											128.3	102.6			575/3/60						1,5,6,7
AHU-39	OVERHEAD DOOR ENTRANCE	ROOF	3,774	0	0%	3774	VFD	191							575/3/60											128.3	102.6			575/3/60						1,5,6,7

NOTES:
1. PRE-FILTER, MERV-8
2. MID FILTER, MERV-13
3. EXHAUST/RETURN AIR RELIEF HEAT PIPE ENERGY RECOVERY
4. AIR SIDE ECONOMIZER
5. C/W MOTORIZED CONTROL DAMPERS AND ACTUATORS
6. UNIT HAS INDIRECT GAS FIRED HEATER WITH MIN. EFF. OF 80%
7. PACKAGED CONTROL SYSTEM
8. EXHAUST STACK

AIR HANDLING UNIT SCHEDULE

UNIT TAG	SERVICE	LOCATION	TOTAL AIRFLOW	O/A (MINIMUM)	O/A (%)	SUPPLY FAN										DX COIL									DESIEN AMBIENT TEMP	HEATING NG @ 35 Kpa				ELECTRIC		PHYSICAL DIMENSIONS					REMARKS
						FLOW	DRIVE	ESP	TSP	Fan RPM	MOTOR				ELECTRIC	AIR FLOW	FACE VELOCITY	EA (DB/WB)	LA (DB/WB)	SENSIBLE CAPACITY	TOTAL CAPACITY	APD	ROW	FLUID		TOTAL CAPACITY (INPUT)	TOTAL CAPACITY (OUTPUT)	EDB	LDB	POWER	CONVENIENCE CIRCUIT	LENGTH	WIDTH	HEIGHT	OPER. WEIGHT	
			L/s	L/s		L/s		Pa	Pa	RPM	BHP	HP	RPM	TYPE	V/PH/HZ	L/s	m/s	°C	°C	KW	KW	Pa			°C/°C	KW	KW	°C	°C	V/PH/HZ	MCA V/PH/HZ	mm	mm	mm	kg	
AC-AHU-1	L1- WICKET AREA	ROOF	2,912	1,784	61%	2912	VFD	381	678	1870	3.92	5.0	1750	ODP	575/3/60	2,912	2.5	25.1 /18.4	11.9 /11.9	47.4	64	140	6	R410a	31 / -20	89.1	71.3	18.9	38.8	575/3/60	40	3,632	2,413	2,057	1,930	1,2,3,4,5,6,7,8
AC-AHU-2	L2- CONTROL CENTRE	ROOF	378	235	62%	378	-	254	302	1569	0.24	1.0	1750	ODP	575/3/60	378	2.5	25.8 /19	5.3 /5.3	9.5	15.8	20	6	R410a	31 / -20	14.6	11.7	17.6	43.3	575/3/60	13.3	2,972	2,235	1,524	1,020	1,2,4,5,6,7,8
AC-AHU-3	L1- OFFICE	ROOF	1,156	531	46%	1156	VFD	254	528	2023	1.29	1.5	1750	ODP	575/3/60	1,156	2.5	25.8/19	14 /14	16.8	20.3	86	6	R410a	31 / -20	26.5	21.2	17.6	34.4	575/3/60	13.8	2,972	2,235	1,524	1,027	1,2,3,4,5,6,7,8
AC-AHU-4	L2- LUNCH ROOM	ROOF	2,906	2,277	78%	2906	VFD	381	650	1845	3.75	5.0	1750	ODP	575/3/60	2,906	2.5	26.3 /19.4	12.9 /12.9	47.7	66	142	6	R410a	31 / -20	117.2	93.8	16.7	43.4	575/3/60	40	3,632	2,413	2,057	1,766	1,2,3,4,5,6,7,8
AC-AHU-5	L2- LOCKERS	ROOF	2,460	2,460	100%	2460	VFD	254	711	2036	3.43	5.0	1750	ODP	575/3/60	2,460	2.5	26.4 /19.8	11.9 /11.9	43.9	64.5	114	6	R410a	31 / -20	117.2	93.8	16.5	48	575/3/60	44.4 120/1/60	5,207	2,413	2,057	2,281	1,2,3,4,5,6,7,8
AC-AHU-6	L2- LOUNGE, CONFERENCE	ROOF	4,632	3,426	74%	4632	VFD	381	724	2381	8.16	10.0	1750	ODP	575/3/60	4,632	2.5	25.3 /19.1	12.7 /12.7	86.4	100.8	74.7	6	R410a	31 / -20	293.1	234.5	17.6	59.6	575/3/60	64.2 120/1/60	5,004	2,565	2,362	2,764	1,2,3,4,5,6,7,8
AC-AHU-7	SHOP OFFICE, LOCKER	ROOF	707	707	100%	707	VFD	254	320	1896	0.48	1.5	1750	ODP	575/3/60	707	2.5	26.4	16	13.4	23.7		6	R410a	31 / -10	59.3	47.4	-4	32.2	575/3/60	13.3	2,942	2,235	1,524	1,027	1,2,5,6,7,8

NOTES:
1. PRE-FILTER, MERV-8
2. MID FILTER, MERV-13
3. EXHAUST/RETURN AIR RELIEF ENERGY RECOVERY
4. AIR SIDE ECONOMIZER
5. C/W MOTORIZED CONTROL DAMPERS AND ACTUATORS
6. UNIT HAS INDIRCT GAS FIRED HEATER WITH MIN. EFF. OF 80%
7. PACKAGED CONTROL SYSTEM WITH MAGNETIC STARTER AND VFDs FOR MOTORS
8. PACKAGE WITH CONDENSING UNIT

BLDG. REF. No.
FILE: STN_81a_hv_sch_01.dgn
SHEET No.
DRAWING No.: G85-314-M560

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Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
APPROVED

McNICOLL BUS GARAGE

H.V.A.C SCHEDULES

Sheet 1 of 7

Plot Date: 06-24-2014

Dwg. No. G85-314-M560

Sheet No.

VAV BOX SCHEDULE

TAG	Location	Qty	Unit Size	Max (Primary L/s)	Min (Primary L/s)	Reheat(L/s)	EAT °C	LAT °C	Capacity (MBH)	Capacity (Kw)	Rows	Fluid Type	Fluid Flow(L/s)	Max Air PD (Pa)	EWT °C	LWT °C	Fluid PD (kPa)	Max Discharge NC	Max Radiated NC	Min Discharge NC	Min Radiated NC	Controller	Weight (Kg)
VAV-1-1	F1	1	8	368	110	110	12.8	23.9	5.22	1.53	1 HC	WTR	0.02	86.4	60.0	44.6	0.42	--	24	--	--	DDC By Div 25	26.1
VAV-1-2	F1	1	10	547	164	164	12.8	23.9	7.77	2.28	1 HC	WTR	0.03	88.9	60.0	42.3	0.84	--	24	--	--	DDC By Div 25	31.1
VAV-1-3	F1	1	7	287	86	86	12.8	23.9	4.09	1.20	1	WTR	0.02	48.3	60.0	45.0	0.30	21	21	--	--	DDC By Div 25	24.7
VAV-1-4	F1	1	8	327	268	268	12.8	23.9	12.70	3.72	2	WTR	0.04	129.5	60.0	39.7	0.45	--	21	--	--	DDC By Div 25	27.2
VAV-1-5	F1	1	10	517	406	406	12.8	23.9	19.23	5.64	2	WTR	0.06	152.4	60.0	36.9	0.90	--	21	--	--	DDC By Div 25	32.2
VAV-1-6	F1	2	10	576	494	494	12.8	23.9	23.40	6.86	2	WTR	0.08	182.9	60.0	39.4	1.49	--	21	--	--	DDC By Div 25	32.2
VAV-1-7	F1	1	4	71	71	71	12.8	23.9	3.37	0.99	1	WTR	0.02	7.6	60.0	47.8	0.24	--	--	--	--	DDC By Div 25	23.6
VAV-1-8	F1	1	4	39	24	24	12.8	32.8	2.00	0.59	1	WTR	0.02	2.5	60.0	52.8	0.24	--	--	--	--	DDC By Div 25	23.6
VAV-1-9	F1	1	5	132	100	100	12.8	23.9	4.70	1.38	1 HC	WTR	0.03	22.9	60.0	48.4	0.42	--	--	--	--	DDC By Div 25	24.1
VAV-3-1	F1	1	4	71	71	71	12.8	23.9	3.35	0.98	1	WTR	0.02	7.6	60.0	47.7	0.21	--	--	--	--	DDC By Div 25	23.6
VAV-3-2	F1	1	4	75	71	71	12.8	23.9	3.35	0.98	1	WTR	0.02	7.6	60.0	47.7	0.21	20	20	--	--	DDC By Div 25	23.6
VAV-3-3	F1	1	6	106	106	106	12.8	23.9	5.02	1.47	1 HC	WTR	0.03	15.2	60.0	49.0	0.48	--	--	--	--	DDC By Div 25	24.1
VAV-3-4	F1	1	4	71	71	71	12.8	23.9	3.35	0.98	1	WTR	0.02	7.6	60.0	47.7	0.21	--	--	--	--	DDC By Div 25	23.6
VAV-3-5	F1	1	6	191	72	72	12.8	23.9	3.42	1.00	1	WTR	0.02	40.6	60.0	47.9	0.24	--	23	--	--	DDC By Div 25	24.1
VAV-3-6	F1	1	8	331	151	151	12.8	23.9	7.14	2.09	1 HC	WTR	0.04	71.1	60.0	48.0	0.99	--	23	--	--	DDC By Div 25	26.1
VAV-3-7	F1	1	6	140	71	71	12.8	23.9	3.35	0.98	1	WTR	0.02	22.9	60.0	47.7	0.21	--	--	--	--	DDC By Div 25	24.1
VAV-6-1	F2	1	0	197	173	173	12.8	26.0	9.70	2.84	2 HC	WTR	0.04	101.0	60.0	42.2	0.27	--	23	--	--	DDC By Div 25	24.7
VAV-6-2	F2	1	10	533	492	492	12.8	24.0	23.50	6.89	2	WTR	0.08	160.0	60.0	39.5	1.52	--	21	--	20	DDC By Div 25	32.2
VAV-6-3	F2	1	6	117	74	74	12.8	24.9	3.80	1.11	1 HC	WTR	0.02	20.3	60.0	47.4	0.27	--	--	--	--	DDC By Div 25	24.1
VAV-6-4	F2	4	12	726	289	289	12.8	23.9	13.66	4.00	1 HC	WTR	0.06	83.8	60.0	43.5	2.93	--	25	--	--	DDC By Div 25	43.1
VAV-6-5	F2	2	9	439	328	328	12.8	24.7	16.60	4.87	2	WTR	0.05	111.8	60.0	36.2	0.69	20	21	--	--	DDC By Div 25	30.4
VAV-6-6	F2	1	8	319	288	288	12.8	26.1	16.30	4.78	2 HC	WTR	0.06	142.2	60.0	42.2	0.81	--	20	--	--	DDC By Div 25	27.2
VAV-6-7	F2	2	9	403	333	333	12.8	23.9	15.78	4.62	2	WTR	0.04	96.5	60.0	34.8	0.57	--	20	--	--	DDC By Div 25	30.4
EVAV-1	F1	1	14	812	812																	DDC By Div 25	
EVAV-2	F2	1	12	624	624																	DDC By Div 25	
FPB	F1	1	2306																				

CABINET FORCE FLOW HEATER

TAG	UNIT CONFIGURATION	SERVICE	LOCATION	DESIGN CAPACITY OUTPUT	AIR		LIQUID					ROWS	FAN MOTOR	ELECTRIC	REMARKS
					FLOW	EAT	FLUID	FLOW	EWT	LWT	PD				
				Kw	L/S	°C		L/S	°C	°C	kPa		HP	V/PH/HZ	
FCU-1	HORIZONTAL CONCEALED, FRONT SA DUCT COLLAR, BACK RA DUCT COLLAR	CORRIDOR 312	CORRIDOR 312	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-2	HORIZONTAL CONCEALED, FRONT SA DUCT COLLAR, BACK RA DUCT COLLAR	VESTIBULE 127	VESTIBULE 127	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-3	VERTICAL CABINET, FRONT TOE INLET, FRONT STAMPED LOUVER OUTLET	STAIRWELL-118	STAIRWELL-118	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-4	VERTICAL CABINET, FRONT TOE INLET, FRONT STAMPED LOUVER OUTLET	STAIRWELL-118	STAIRWELL-118	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-5	VERTICAL CABINET, FRONT TOE INLET, FRONT STAMPED LOUVER OUTLET	STAIRWELL-316	STAIRWELL-316	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-6	VERTICAL CABINET, FRONT TOE INLET, FRONT STAMPED LOUVER OUTLET	STAIRWELL-316	STAIRWELL-316	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-7	VERTICAL CABINET, FRONT TOE INLET, FRONT STAMPED LOUVER OUTLET	STAIRWELL-121	STAIRWELL-121	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-8	VERTICAL CABINET, FRONT TOE INLET, FRONT STAMPED LOUVER OUTLET	STAIRWELL-121	STAIRWELL-121	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-9	VERTICAL CABINET, FRONT TOE INLET, FRONT STAMPED LOUVER OUTLET	STAIRWELL-121	STAIRWELL-121	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-10	HORIZONTAL CONCEALED, FRONT SA DUCT COLLAR, BACK RA DUCT COLLAR	VESTIBULE 125	VESTIBULE 125	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-11	HORIZONTAL CONCEALED, FRONT SA DUCT COLLAR, BACK RA DUCT COLLAR	VESTIBULE 101	VESTIBULE 101	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-12	HORIZONTAL CONCEALED, FRONT SA DUCT COLLAR, BACK RA DUCT COLLAR	VESTIBULE	VESTIBULE	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1
FCU-13	HORIZONTAL CONCEALED, FRONT SA DUCT COLLAR, BACK RA DUCT COLLAR	VESTIBULE	VESTIBULE	2.10	32	15.6	WATER	0.051	82.2	71.1	8		100W	115/1/60	1

NOTES:
1. REFER TO PLAN FOR HEATING COIL CONNECTIONS SIDE FOR EACH UNIT.

ELECTRIC BASE BOARD HEATER SCHEDULE

TAG	SERVICE	TYPE	UNIT CONFIGURATION	KW	LENGTH	ELECTRIC	NOTE
					M	V/PH/HZ	
BB-1	JANITOR CLOSET	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-2	UPS ROOM	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-3	LAN ROOM713	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-4	TELECOM ROOM 714	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-5	MCC 517 ROOM	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-6	MAIN TELECOM 516 ROOM	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-7	MAIN LAN ROOM 515	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-8	TELECOM ROOM 809	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-9	LAN ROOM808	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-10	MCC ROOM807	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-11	STAIR 804	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-12	STAIR 804	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-13	STAIR 804	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-14	STAIR 707	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-15	STAIR 707	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-16	CORRIDOR 246	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-17	CORRIDOR 246	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-18	CORRIDOR 246	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-19	CORRIDOR 246	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-20	CORRIDOR 246	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-21	CORRIDOR 246	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-22	CORRIDOR 246	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-23	CORRIDOR 246	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	1
BB-24	MAIN ELECT ROOM	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	2
BB-25	MAIN ELECT ROOM	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	2
BB-26	WOMEN WASHROOM 816	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	2
BB-27	COMPRESSOR ROOM	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.000	1.200	120/60/1	1
BB-28	COMPRESSOR ROOM	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.000	1.200	120/60/1	1
BB-29	WASH AREA ENTRY	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	2
BB-30	WASH AREA ENTRY	LINEAR CONVECTOR	FRONT DISCHARGE HEAT TRANSFER	1.25	1.524	120/60/1	2

NOTES:
1. C/W BUILT-IN ELECTRONIC PROPORTIONING THERMOSTAT
2. WALL MOUNTED REMOTE CONTROL THERMOSTAT

EXPANSION TANK SCHEDULE

TAG	SERVICE	LOCATION	FLUID	CAPACITY	ACCEPT VOLUME	DIMENSION		ARRANGEMENT	NOTES
						DIA.	HEIGHT		
				L	L	MM	MM		
ET-1	HOT WATER LOOP	MECH RM	WATER	530	217	610	1829 MIN.	VERTICAL	1, 2,3

NOTES:
1. ASME RATED DIAPHRAGM TYPE
2. SUITABLE FOR 125PSI MAXIMUM WORKING PRESSURE
3. C/W SEISMIC RESTRAINTS

AIR SEPARATOR SCHEDULE

TAG	SERVICE	LOCATION	FLUID	FLOW RATE	PIPE SIZE	DIMENSION		NOTES
				L/S	MM	WIDTH (MM)	HEIGHT (MM)	
AS-1	HEATING WATER LOOP	BOILER RM	WATER	2.0		457	585	1,2,3

NOTES:
1. ASME RATED
2. REMOVABLE 304 S/S STRAINER
3. C/W SEISMIC RESTRAINTS

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McNICOLL BUS GARAGE

H.V.A.C SCHEDULES

Sheet 2 of 7

Plot Date: 08-27-2014

Dwg. No. G85-314-M561

Sheet No.

HEAT RECOVERY UNIT SCHEDULE

TAG	SERVICE	DESIGN CONDITION	SUPPLY							EXHAUST						REMARK
			AIR FLOW	EDB	EWB	LDB	LWB	APD	ENERGY RECOVERY	AIR FLOW	EDB	FH	LDB	LWB	APD	
			L/S	°C	°C	°C	°C	Pa	Kw	L/S	°C	%	°C	°C	Pa	
HRU-AHU-1	AHU-1	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-2	AHU-2	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-3	AHU-3	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-4	AHU-4	WNTER	8,491	-20	-20	-4.0	-7.4	140	165	8491	22	15	-7.4	-8.9	149	1
HRU-AHU-5	AHU-5	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-6	AHU-6	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-7	AHU-7	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-8	AHU-8	WNTER	8,491	-20	-20	-4.0	-7.4	140	165	8491	22	15	-6.7	-8.9	145	1
HRU-AHU-9	AHU-9	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-10	AHU-10	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-11	AHU-11	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-12	AHU-12	WNTER	8,491	-20	-20	-4.0	-7.4	140	165	8491	22	15	-6.7	-8.9	145	1
HRU-AHU-13	AHU-13	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-14	AHU-14	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-15	AHU-15	WNTER	7,075	-20	-20	-3.7	-7.2	122	140	7075	22	15	-7.4	-9.1	127	1
HRU-AHU-16	AHU-16	WNTER	8,491	-20	-20	-4.0	-7.4	140	165	8491	22	15	-6.7	-8.9	145	1
HRU-AHU-17	AHU-17	WNTER	9,670	-20	-20	2.3	-3.3	137	262	9670	22	15	-2.3	-3.7	147	1
HRU-AHU-18	AHU-18	WNTER	9,670	-20	-20	2.3	-3.3	137	262	9670	22	15	-2.3	-3.7	147	1
HRU-AHU-19	AHU-19	WNTER	9,670	-20	-20	2.3	-3.3	137	262	9670	22	15	-2.3	-3.7	147	1
HRU-AHU-20	AHU-20	WNTER	9,670	-20	-20	2.3	-3.3	137	262	9670	22	15	-2.3	-3.7	147	1
HRU-AHU-21	AHU-21	WNTER	8,632	-20	-20	2.2	-3.4	142	233	8632	22	15	-2.1	-3.7	152	1
HRU-AHU-22	AHU-22	WNTER	8,632	-20	-20	2.2	-3.4	142	233	8632	22	15	-2.1	-3.7	152	1
HRU-AHU-23	AHU-23	WNTER	15,142	-20	-20	2.3	-3.3	137	410	15142	22	15	-2.2	-3.7	147	1
HRU-AHU-25	AHU-25	WNTER	6,651	-20	-20	2.4	-3.2	132	181	6651	22	15	-2.4	-3.8	140	1
HRU-AHU-26	AHU-26	WNTER	9,340	-20	-20	2.2	-3.3	140	252	9340	22	15	-2.1	-3.7	150	1
HRU-AHU-27	AHU-27	WNTER	7,642	-20	-20	2.3	-3.3	137	207	7642	22	15	-2.2	-3.7	147	1
HRU-AHU-28	AHU-28	WNTER	7,170	-20	-20	2.3	-3.3	137	194	7170	22	15	-2.2	-3.7	147	1
HRU-AHU-29	AHU-29	WNTER	8,396	-20	-20	2.2	-3.4	140	226	8396	22	15	-2.1	-3.7	150	1
HRU-AHU-30	AHU-30	WNTER	8,396	-20	-20	2.2	-3.4	140	226	8396	22	15	-2.1	-3.7	150	1
HRU-AHU-31	AHU-31	WNTER	8,113	-20	-20	2.3	-3.3	140	220	8113	22	15	-2.2	-3.7	147	1
HRU-AHU-32	AHU-32	WNTER	3,868	-20	-20	2.3	-3.3	135	105	3868	22	15	-2.3	-3.8	145	1
HRU-AHU-33	AHU-33	WNTER	2,925	-20	-20	2.3	-3.3	140	79	2925	22	15	-2.2	-3.7	147	1
HRU-AHU-34	AHU-34	WNTER	3,538	-20	-20	2.3	-3.3	137.0	95.7	3538	22	15	-2.2	-3.7	147	1

NOTES:
1. PACKAGED WITH AHU

SILENCER SCHEDULE

TAG	FAN SYSTEM	FACE DIM		LENGTH	FLOW	VELOCITY	PRESSURE DROP	PRESSURE DROP W/ SYSTEM EFFECTS	DYNAMIC INSERTION LOSS								NOTES
		W (MM)	H (MM)	MM	L/S	M/s	Pa	Pa	63	125	250	500	1000	2000	4000	8000	
SL-S-1	AC-AHU-1 SUPPLY AIR	600	600	2400	2,912	8.1	42	70	5	12	21	36	35	24	15	11	
SL-R-1	AC-AHU-1 RETURN AIR	750	500	3000	2702	-7.2	28	61	4	13	23	31	26	17	14	13	
SL-S-2	AC-AHU-2 SUPPLY AIR	250	350	2100	378	4.3	49	78	8	17	27	38	43	39	34	29	
SL-R-2	AC-AHU-2 RETURN AIR	250	350	3600	143	-1.6	31	74	8	24	30	47	50	47	37	26	
SL-S-3	AC-AHU-3 SUPPLY AIR	500	350	2400	1,156	6.6	42	70	8	16	27	28	31	19	15	12	
SL-R-3	AC-AHU-3 RETURN AIR	500	350	3000	1055	-6.0	26	56	9	20	31	32	30	19	14	13	
SL-S-4	AC-AHU-4 SUPPLY AIR	500	800	3000	2,906	7.3	26	56	10	19	18	30	41	35	24	23	
SL-R-4	AC-AHU-4 RETURN AIR	700	900	3600	2615	-4.2	15	59	10	22	23	33	52	39	26	20	
SL-S-5	AC-AHU-5 SUPPLY AIR	350	650	2700	2,460	10.6	26	89	7	15	25	28	36	37	35	25	
SL-R-5	AC-AHU-5 RETURN AIR	450	650	3600	2460	-8.4	34	82	9	24	36	50	46	46	45	27	
SL-S-6	AC-AHU-6 SUPPLY AIR	600	900	2700	4,632	8.6	15	54	10	17	16	28	37	32	22	22	
SL-R-6	AC-AHU-6 RETURN AIR	600	900	3600	4231	7.8	33	72	13	23	30	36	48	36	24	28	

NOTES:

1. SELECTION OF SLENCERS BASED ON MAINTANING SPACE SOUND LEVEL AT NC-35 WITH SPECIFIED SOUND POWER LELVEL FROM AHUs.

GAS-FIRED CONDENSING BOILER SCHEDULE

TAG	TYPE	SERVICE	LOCATION	INPUT	OUTPUT (SEE NOTE 6)	EFFICIENCY (SEE NOTE 6)	TEMPERATURE		FUEL	NATURAL GAS SUPPLY PRESSURE	NATURAL GAS CONSUMPTION	MAX. OPERATING WEIGHT	NOTES
							OPERATING	HI-LIMIT					
				Kw	Kw	%	°C	°C		kPa	M^3/HR	KG	
B-1	HIGH EFF. CONDENSING	HEATING WATER	BOILER ROOM 219	95	93	97.4	20-90	110	NATURAL GAS	1.25	9.2	115	1,2,3,4,5,6
B-2	HIGH EFF. CONDENSING	HEATING WATER	BOILER ROOM 219	95	93	97.4	20-90	110	NATURAL GAS	1.25	9.2	115	1,2,3,4,5,6

NOTES:
1. DUAL HEATING WATER RETURN INLETS TO BOILER FOR HIGH AND LOW TEMPERATURE RETURN WATER.
2. MODULATNG BURNER
3. STAINLESS STEEL BURNER; CAST ALUMINUM / SILICIUM SECTIONAL HEAT EXCHANGER
4. NEUTRALIZING TANK
5. BACNet COMPATIBLE ELECTRONIC CONTROL PANEL.
6. INDICATED BOILER OUTPUT IS AT 70°C BOILER SUPPLY WATER TEMPERATURE AND 50°C RETURN WATER TEMPERATURE TO BOILER.
7. DIRECT VENTING AIR INTAKE AND FLUE DISCHARGE PIPE PACKAGE

HEAT RECOVERY UNIT SCHEDULE

TAG	SERVICE	DESIGN CONDITION	SUPPLY FAN								SUPPLY SIDE PERFORMANCE							EXHAUST FAN								EXHAUST SIDE PERFORMANCE							PHYSICAL DIMENSIONS			OPER. WEIGHT	REMARK
			FLOW	DRIVE	ESP	Fan RPM	MOTOR				ELECTRIC	AIR FLCW	EDB	EWB	LDB	LWB	APD	RECOVERY	FLOW	DRIVE	ESP	Fan RPM	MOTOR			ELECTRIC	AIR FLOW	EDB	RH	LDB	LWB	APD	RECOVERY	LENGTH	WIDTH	HEIGHT		
			L/S		Pa	RPM	BHP	HP	RPM	TYPE	V/PH/HZ	L/S	°C	°C	°C	°C	Pa	Kw	L/S		Pa	RPM	BHP	HP	RPM	TYPE	V/PH/HZ	L/S	°C	%	°C	°C	Pa	Kw	mm	mm	mm	kg	
HRU-1	AC-AHU-1	SUMMER	1784	VFD	191	1870	3.92	5	1750	ODP	575/3/60	1,784	31	23	27.8	22.1	152	7	2702	VFD	191	1870	3.92	5	1750	ODP	575/3/60	1,574	25.0	53%	28.6	19.5	122	7	4,089	2,032	2,159		
		WINTER										1,784	-20	-	2.8	-3.3	43	35.7										1,574	22	-	3.3	2.4	114	35.7					
HRU-3	AC-AHU-3	SUMMER	531	VFD	191	2023	1.29	1.5	1750	ODP	575/3/60	531	31	23	27.8	22.1	157	2.1	1055	VFD	191	2023	1.29	1.5	1750	ODP	575/3/60	430	24.7	50%	28.7	18.9	109	2.1	4,089	2,032	2,159		
		WINTER										531	-20	-	-1.6	-5.9	38	9.7										430	22	-	3.3	2.4	102	9.7					
HRU-4	AC-AHU-4	SUMMER	2277	VFD	191	1845	3.75	5	1750	ODP	575/3/60	2,277	31	23	27.4	22	160	10.3	2615	VFD	191	1845	3.75	5	1750	ODP	575/3/60	1,986	24.0	45%	28.2	17.7	124	10.3	4,089	2,032	2,159		
		WINTER										2,277	-20	-	5.3	-1.8	46	45.1										1,986	22	-	3.3	2.4	117	45.1					
HRU-5	AC-AHU-5	SUMMER	2460	VFD	191	2036	3.43	5	1750	ODP	575/3/60	2,460	31	23	28.2	22.2	163	8.4	2460	VFD	191	2036	3.43	5	1750	ODP	575/3/60	2,460	26.0	60%	28.8	21.2	160	8.4	4,089	2,032	2,159		
		WINTER										2,460	-20	-	4.9	-2	64	55.9										2,460	22	-	3.3	2.4	150	55.9					
HRU-6	AC-AHU-6	SUMMER	3426	VFD	191	2381	8.16	10	1750	ODP	575/3/60	3,426	31	23	27.6	22	165	14.6	4231	VFD	191	2381	8.16	10	1750	ODP	575/3/60	3,026	24.4	48%	28.3	18.4	132	14.6	4,089	2,032	2,159		
		WINTER										3,426	20		0.6	0.7	48	68.7										3,026	22		3.3	2.4	124	68.7					

RADIANT PANEL SCHEDULE

TAG	TYPE	LOCATION	PANEL WIDTH	NUMBER OF TUBES	CAPACITY	EAT	WATER (WINTER)					NOTES
							EWT	LWT	FLUID	FLOW RATE	PD	
			MM		W/M	°C	°C	°C		L/S/M	kPa/M of PANEL	
RP-1	LINER PANEL C/W COPPER TUBING &	SEE DWGS	600	4	397.0	21.1	82.2	71.1	WATER	0.009	0.004	1, 2,3,4
RP-2	LINER PANEL C/W COPPER TUBING &	SEE DWGS	600	4	397.0	21.1	82.2	71.1	WATER	0.009	0.004	1, 2,3,5

NOTES:
1. PANEL SHALL BE SUPPLIED AS SINGLE PANEL UP TO A MAXIMUM LENGTH OF 4.8 METER. REFER TO PLANS FOR ACTUAL LENGTHS & CONFIGURATION OF PANEL
2. C/W 25MM MIN. INSULATION
3 PANEL SUPPLIED SHALL BE COMPATIBLE WITH ARCHITECTURAL CEILING TYPE AND FINISH
4. COMPLETE WITH FRAMING SUITABLE FOR LAY-IN TYPE ACOUSTIC CEILING.
5. COMPLETE WITH FRAMING SUITABLE FOR HARD CEILING AS GYPSUM AND WOOD CEILING

WALL FIN SCHEDULE

TAG	TYPE	ARRANGEMENT	LOCATION	FIN LENGTH	HEATING OUTPUT	EAT	WATER		MAX. HEIGHT	NOTES
							EWT	LWT		
				M	kW/M	°C	°C	°C	MM	
WF-XX	ALUMINUM FINS / COPPER TUBE	BOTTOM INLET / FRONT OUTLET	SEE DWGS	6.5	0.97	18.3	82.2	71.1	300	1,2

NOTES:
1. COORDINATE WITH ARCHITECT THE CABINET ARRANGEMENT AND THE ASSOCIATED ACCESSORIES PRIOR TO ORDERING;
2. C/W NECESSARY ACCESSIES INCLUDING END PIECE, WALL TRIM, ACCESS PANELS, ETC.

DOMESTIC HOT WATER STORAGE TANK SCHEDULE

TAG	SERVICE	LOCATION	STORAGE CAPACITY	JACKET DIA.	HEIGHT	NOTE
			M^3	mm	mm	
ST-1	DOMESTIC HOT WATER	BOILER ROOM 219	0.45	711	1588	1,2,3
ST-2	DOMESTIC HOT WATER	BOILER ROOM 219	0.45	711	1588	1,2,3

NOTE:
1. LINED WITH ENAMEL FORMULA TO PROTECT TANK FROM CORROSIVE EFFECT OF HOT WATER
2. NON-CFC INSULATION
3. PROTECTIVE MAGNESIUM ANODE RODS

DUST COLLECTOR SCHEDULE

TAG	SERVICE	LOCATION	TYPE	AIR SUCTION CAPACITY	MAX. STATIC PRESSURE	MAIN INLET SIZE	MOTOR		ELECTRIC	WEIGHT
				L/s	KPa	mm DIA.	RPM	HP	V/PH/HZ	Kg
DC-1	BODY SHOP	BODY SHOP	WALL MOUNT	253	1.8	100	3450	1	115/1/60	23.6
DC-2	BODY SHOP	BODY SHOP	WALL MOUNT	253	1.8	100	3450	1	115/1/60	23.6

BLDG. REF. No.
FILE: STN_81s_hv_sch_03.dgn
SHEET No.
DRAWING No.: G85-314-M562

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S)

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
APPROVED

McNICOLL BUS GARAGE

H.V.A.C SCHEDULES

Sheet 3 of 7

Plot Date: 06-28-2014

Dwg. No. G85-314-M562

Sheet No.

CONTROL VALVE SCHEDULE

TAG	TYPE	SERVICE	LOCATION	FLOW	MEDIUM	DESIGN PD	PIPE LINE SIZE	CONTROL VALVE SIZE	NOTES
				L/S		kPa	DIA. MM	DIA. MM	
CV-B-1.1	2-WAY, ON/OFF	B-1 HIGH TEMP HEATING RETURN	219 - BOILER ROOM		HOT WATER				2
CV-B-1.2	2-WAY, ON/OFF	B-1 LOW TEMP HEATING RETURN	219 - BOILER ROOM		HOT WATER				2
CV-B-2.1	2-WAY, ON/OFF	B-2 HIGH TEMP HEATING RETURN	219 - BOILER ROOM		HOT WATER				2
CV-B-2.2	2-WAY, ON/OFF	B-2 LOW TEMP HEATING RETURN	219 - BOILER ROOM		HOT WATER				2
FCU-1	PICCV	HEATING COIL	312 - CORRIDOR	0.103	PROPYLENE GLYCOL 50%		15	15	2
FCU-2	PICCV	HEATING COIL	127 - VESTIBULE	0.051	PROPYLENE GLYCOL 50%		15	15	2
FCU-3	PICCV	HEATING COIL	118 - STAIRWELL	0.051	PROPYLENE GLYCOL 50%		15	15	2
FCU-4	PICCV	HEATING COIL	118 - STAIRWELL	0.051	PROPYLENE GLYCOL 50%		15	15	2
FCU-5	PICCV	HEATING COIL	316 - STAIRWELL	0.051	PROPYLENE GLYCOL 50%		15	15	2
FCU-6	PICCV	HEATING COIL	121 - STAIRWELL	0.000	PROPYLENE GLYCOL 50%		15	15	2
FCU-7	PICCV	HEATING COIL	121 - STAIRWELL	0.051	PROPYLENE GLYCOL 50%		15	15	2
FCU-8	PICCV	HEATING COIL	121 - STAIRWELL	0.051	PROPYLENE GLYCOL 50%		15	15	2
FCU-9	PICCV	HEATING COIL	125 - STAIRWELL	0.051	PROPYLENE GLYCOL 50%		15	15	2
FCU-10	PICCV	HEATING COIL	125 - VESTIBULE	0.051	PROPYLENE GLYCOL 50%		15	15	2
FCU-11	PICCV	HEATING COIL	101 - VESTIBULE	0.051	PROPYLENE GLYCOL 50%		15	15	2
FCU-12	PICCV	HEATING COIL	101 - VESTIBULE	0.051	PROPYLENE GLYCOL 50%		15	15	2
FCU-13	PICCV	HEATING COIL	101 - VESTIBULE	0.051	PROPYLENE GLYCOL 50%		15	15	2
CV-VAV-1	3-WAY, MOD. MIXING	VAV REHEATING SUPPLY MAIN	219 - BOILER ROOM	0.86	HOT WATER	22.5	32/32/40	25	1,2
CV-VAV-1-1	PICV	REHEAT COIL	102 - LUNCH ROOM	0.02	HOT WATER		15	15	1,2
CV-VAV-1-2	PICV	REHEAT COIL	103 - DIVISION MANAGER	0.03	HOT WATER		15	15	1,2
CV-VAV-1-3	PICV	REHEAT COIL	103 - DIVISION MANAGER	0.02	HOT WATER		15	15	1,2
CV-VAV-1-4	PICV	REHEAT COIL	106 - OPEN OFFICE	0.04	HOT WATER		15	15	1,2
CV-VAV-1-5	PICV	REHEAT COIL	119 - WICKET	0.06	HOT WATER		15	15	1,2
CV-VAV-1-6.1,2	PICV	REHEAT COIL	123 - WICKET QUEING	0.08	HOT WATER		15	15	1,2
CV-VAV-1-7	PICV	REHEAT COIL	116 - OFFICE STORAGE	0.02	HOT WATER		15	15	1,2
CV-VAV-1-8	PICV	REHEAT COIL	323 - FIRST AID	0.02	HOT WATER		15	15	1,2
CV-VAV-1-9	PICV	REHEAT COIL	115 - LOCKER	0.03	HOT WATER		15	15	1,2
CV-VAV-3-1	PICV	REHEAT COIL	305 - CORRIDOR	0.02	HOT WATER		15	15	1,2
CV-VAV-3-2	PICV	REHEAT COIL	305 - CORRIDOR	0.02	HOT WATER		15	15	1,2
CV-VAV-3-3	PICV	REHEAT COIL	306 - KITCHEN	0.03	HOT WATER		15	15	1,2
CV-VAV-3-4	PICV	REHEAT COIL	303 - MAINTENANCE OFFICE STORAGE	0.02	HOT WATER		15	15	1,2
CV-VAV-3-5	PICV	REHEAT COIL	303 - MAINTENANCE OFFICE STORAGE	0.02	HOT WATER		15	15	1,2
CV-VAV-3-6	PICV	REHEAT COIL	307 - LIBRARY OPEN OFFICE	0.04	HOT WATER		15	15	1,2
CV-VAV-3-7	PICV	REHEAT COIL	307 - LIBRARY OPEN OFFICE	0.02	HOT WATER		15	15	1,2
CV-VAV-6-1	PICV	REHEAT COIL	214 - MEETING ROOM	0.04	HOT WATER		15	15	1,2
CV-VAV-6-2	PICV	REHEAT COIL	202 - RECREATION ROOM	0.08	HOT WATER		15	15	1,2
CV-VAV-6-3.1,2,3,4	PICV	REHEAT COIL	227 - SIGN UP ROOM	0.02	HOT WATER		15	15	1,2
CV-VAV-6-4	PICV	REHEAT COIL	201 - OPERATORS LOUNGE	0.06	HOT WATER		15	15	1,2
CV-VAV-6-5	PICV	REHEAT COIL	215 - CORRIDOR	0.05	HOT WATER		15	15	1,2
CV-VAV-6-6	PICV	REHEAT COIL	216 - CONFERENCE ROOM	0.06	HOT WATER		15	15	1,2
CV-VAV-6-7.1,2	PICV	REHEAT COIL	230 - BOARD/CLASS ROOM	0.04	HOT WATER		15	15	1,2
CV-RP-1-1	PICV	RADIANT PANEL	102 - LUNCH ROOM	0.03	HOT WATER		20	15	1,2
CV-RP-1-1	PICV	RADIANT PANEL	104, 105 - ASSISTANT DIVISION MANAGER	0.05	HOT WATER		20	15	1,2
CV-RP-1-1	PICV	RADIANT PANEL	103 - DIVISION MANAGER	0.02	HOT WATER		20	15	1,2
CV-RP-1-1	PICV	RADIANT PANEL	304 - SENIOR FOREPERSON	0.03	HOT WATER		20	15	1,2
CV-RP-1-1	PICV	RADIANT PANEL	301, 302 - OPERATIONS MANAGER, ASSISTANT	0.05	HOT WATER		20	15	1,2
CV-RP-1-1	PICV	RADIANT PANEL	307, 308 309 - OFFICE	0.09	HOT WATER		20	15	1,2
CV-RP-1-1	PICV	RADIANT PANEL	310 - FOREPERSON OFFICE	0.06	HOT WATER		20	15	1,2
CV-RP-1-1	PICV	RADIANT PANEL	231 - MAINT LUNCH ROOM	0.13	HOT WATER		20	15	1,2
CV-RP-1-1	PICV	RADIANT PANEL	201 - OPERATORS LOUNGE	0.21	HOT WATER		20	15	1,2
CV-WF-1	PICV	WALL FIN	319 - MENS WASHROOM	0.02	HOT WATER		15	15	1,2
CV-WF-2	PICV	WALL FIN	322 - WOMEN'S WASHROOM	0.01	HOT WATER		15	15	1,2
CV-WF-3	PICV	WALL FIN	206 - VESTIBULE	0.01	HOT WATER		15	15	1,2
CV-WF-4	PICV	WALL FIN	210 - MENS WASHROOM	0.03	HOT WATER		15	15	1,2
CV-WF-5	PICV	WALL FIN	204 - VESTIBULE	0.01	HOT WATER		15	15	1,2

NOTES:
1. PICV SHALL BE SIZED FOR LINE SIZE.
2. CONTRACTOR TO VERIFY CONTROL VALVE SCHEDULE WITH REFERENCE TO FLOOR PLANS AND HYDRONIC SCHEMATICS BEFORE ORDERING.

CEILING FAN SCHEDULE

TAG	LOCATION	SERVICE	SIZE	MAX. RPM	POWER	dBA	ELECTRIC		PHASE	WEIGHT	NOTES
			DIA. (mm)		HP		V/PH/HZ	MCA		kg	
CF-1	MAINTENANCE BAY	SUPPLY AIR DE-STRATIFICATION	7315	55	2	55	575/3/60		3	185	1,2,3
CF-2	MAINTENANCE BAY	SUPPLY AIR DE-STRATIFICATION	7315	55	2	55	575/3/60		3	185	1,2,3
CF-3	MAINTENANCE BAY	SUPPLY AIR DE-STRATIFICATION	7315	55	2	55	575/3/60		3	185	1,2,3
CF-4	MAINTENANCE BAY	SUPPLY AIR DE-STRATIFICATION	7315	55	2	55	575/3/60		3	185	1,2,3

NOTES:
1. DIGITAL WALL KEYPAD
2. C/W VARIABLE SPEED DRIVE
3. INTERFACE W/ BAS SYSTEM

ELECTRODE HUMIDIFIER SCHEDULE

TAG	SERVICE	LOCATION	CAPACITY	ELECTRIC		DUCT SIZE	STEAM ABSORBTION DISTANCE	MODEL	MAKE	NOTES
			kg/hr	Kw	V/PH/HZ	mm X mm	mm			
H-1	OFFICES	L1 - CEILING OF RECYCLING CLOSET 117	51.3	39.12	575/3/60		134			1~8
H-2	CIS CONTROL CENTRE	L2 - JANITOR STORAGE 204	6.7	5.08	575/3/60		134			1~8
H-3	OFFICES	L1 - JANITOR CLOSET 107	20.4	15.52	575/3/60		134			1~8
H-4	MAINT LUNCHROOM	L2 - CEILING OF LUCNH ROOM 231	51.2	39.03	575/3/60		134			1~8
H-6	LOUNGE, CONFERENCE AREA	L2 - JANITOR STORAGE 204	81.6	62.21	575/3/60		134			1~8

NOTES:
1. HARD PIPE KIT TO SUIT 1.75" INTERCONNECTING PIPE
2. C/W AIRFLOW PROVING SWITCH
3. HUMIDISTAT FOR REMOTE MOUNTING
4. C/W ON-OFF HIGH LIMIT CONTROL
5. ELECTRICAL TAPPINGS FOR INTERLOCKS
6. C/W WALL MOUNTING KIT
7. DDC INTERFACE WITH BUILDING BMS SYSTEM
8. IN-DUCT SHORT ABSORPTION MANIFOLD

AIR TERMINAL SCHEDULE

TAG	TYPE	SIZE	CORE STYLE	BORDER STYLE	BLADE ORIENTATION	FINISH	MAKE	MODEL	NOTES
S1	SUPPLY GRILLE	SEE DWGS	DRUM LOUVER	SURFACE	-	WHITE	EH PRICE	HCD2/F/A/B12	1,3,5
S2	SUPPLY REGISTER	SEE DWGS	DOUBLE DEFLECTION REGISTER	SURFACE	L	WHITE	EH PRICE	520D/F/L/A/B12	1,4,5
S3	SUPPLY DIFFUSER - 3 CONE	600X600 FACE / NECK AS NOTED	SQUARE CONE DIFFUSER	T-BAR	-	WHITE	EH PRICE	SCDA/3/3C/B12	1,4,5
S4	SUPPLY DIFFUSER - ROUND CONE	SEE DWGS	ROUND CONE DIFFUSER	SURFACE	-	WHITE	EH PRICE	RCDA/B13	1,4,5
E1	RETURN / EXHAUST GRILL	SEE DWGS	FIXED LOUVER - 45° DEFLECTION, 3/4" BLADE SPACING	SURFACE	L	WHITE	EH PRICE	530/F/L/A/B12	1,5
E2	RETURN / EXHAUST GRILL	SEE DWGS	FIXED LOUVER - 45° DEFLECTION, 3/4" BLADE SPACING	T-BAR	L	WHITE	EH PRICE	530/F/L/TB/B12	1,5
J	DOOR GRILLE	750X400	ALUMINUM DOOR GRILLE	FLAT BORDER, BOTH SIDES	L	ALUMINUM POWDER COAT	EH PRICE	ATG1/BF/B15	5
R1	RETURN AIR GRILLE	SEE DWGS	EGG CRATE GRILLE	T-BAR	-	WHITE	EH PRICE	80/B12	4,5

NOTES:
1. COORDINATE W/ ARCHITECT THE REQUIRED BORDER TYPE, END CAP, AND FINISH PRIOR TO ORDERING
2. INTERNAL INSULATED
3. POLE OPERATOR BRACKET
4. VOLUME CONTROL DAMPER
5. APPROVED EQUAL FROM OTHER MANUFACTURER SHALL BE ACCEPTED

RETRACTABLE FUME EXHAUST HOOD SCHEDULE

TAG	SERVICE	LOCATION	TYPE	ARM REACH	AIR FLOW	PRESSURE DR	CONNECTION	FUME TEMP	NOISE	MOTOR	ELECTR	WEIGHT	NOTES
				mm	L/s	Kpa	mm DIA.	°C	dBa	HP	V/PH/HZ	Kg	
EXARM-1		BODY SHOP	ARM ORIGINAL	3000	194 - 278	550 - 1200	150/160	70 MAX.	63 - 75	1.2	480/3/60	13	1,2,3,4,5,10
EXARM-2		BODY SHOP	ARM ORIGINAL	3000	194 - 278	550 - 1200	150/160	70 MAX.	63 - 75	1.2	480/3/60	13	1,2,3,4,5,10
EXARM-3		CIS ROOM	BENCH TOP EXTRACTION	1100	27.8		50/75	-10 - 70		0.2	115/1/60	14	1,6,7,8,9,10
EXARM-4		CIS ROOM	BENCH TOP EXTRACTION	1100	27.8		50/75	-10 - 70		0.2	115/1/60	14	1,6,7,8,9,10

NOTES:
1. 360° SWIVEL
2. FLEXIBLE ARM IN ALL DIRECTIONS
3. C/W DAMPER
4. WALL BRACKET
5. FAN MANUAL STARTER
6. ARM C/W ANODIZED ALUMINUM TUBING WITH POLYPROPENE JOINTS
7. FAN SPEED CONTROL
8. FAN FILTER
9. TABLE BRACKET
10. EXHAUST ARM C/W FAN AND ALL OTHERS ACCESSORY

DOWNDRAFT WELDING TABLE

TAG	SERVICE	LOCATION	TYPE	AIR FLOW	FILTER TYPE	FILTER SIZE	TABLE DIMENSION	MOTOR	ELECTRIC	WEIGHT	NOTES
				L/s		M^2	H x W x D mm	(A)	V/PH/HZ	Kg	
DDWT-1		BODY SHOP	WORKBENCH & DOWNDRAFT EXTRACTION	825	CELLULOSE/POLYESTER FIBER	52	920 x 1380 x 1005	11	208/3/60	245	1,2,3,4,5
DDWT-2		BODY SHOP	WORKBENCH & DOWNDRAFT EXTRACTION	825	CELLULOSE/POLYESTER FIBER	52	920 x 1380 x 1005	11	208/3/60	245	1,2,3,4,5

NOTES:
1. 80% BACKDRAFT / 20% DOWNDRAFT
2. LOCKING FRONT DOORS
3. PULL OUT DRAWERS
4. HINGED / REMOVABLE SIDE PANELS

BLDG. REF. No.
FILE: STN_81s_hv_sch_04.dgn
SHEET No.
G85-314-M563
DRAWING No.

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S)

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
APPROVED

McNICOLL BUS GARAGE

H.V.A.C SCHEDULES

Sheet 4 of 7

Plot Date: 06-27-2014

Dwg. No. G85-314-M563

Sheet No.

UNIT HEATER SCHEDULE

TAG	SERVICE	LOCATION	TYPE	HEATING INPUT KW	HEATING OUTPUT KW	GAS SUPPLY PRESSURE Kpa	UNIT CONFIGURATION	MOUNTING HEIGHT M	ELECTRIC INFORMATION FLA (A)	ELECTRIC INFORMATION V/PH/HZ	CONTROL VOLTS	WEIGHT KG	NOTE
UH-1	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-2	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-3	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-4	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-5	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-6	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-7	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-8	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-9	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-10	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-11	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-12	STORAGE BAY	STORAGE BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-13	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-14	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-15	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-16	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-17	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-18	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-19	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-20	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-21	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-22	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-23	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-24	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-25	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-26	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-27	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-28	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-29	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-30	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-31	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-32	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-33	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-34	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-35	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-36	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-37	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-38	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-39	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-40	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-41	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-42	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-43	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-44	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-45	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-46	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-47	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-48	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-49	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-50	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-51	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-52	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-53	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-54	STORAGE BAY	STORAGE BAY	GAS FIRED	58.6	48.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	4.6	208/60/1	24	85	1,2
UH-55	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	102.6	85.1	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	134	1,2
UH-56	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	102.6	85.1	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	134	1,2
UH-57	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	102.6	85.1	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	134	1,2
UH-58	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-59	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-60	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-61	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-62	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-63	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-64	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-65	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	87.9	73	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	122	1,2
UH-66	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	102.6	85.1	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	134	1,2
UH-67	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	102.6	85.1	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	11	208/60/1	24	134	1,2
UH-68	FUEL BAY	FUEL BAY	GAS FIRED	65.9	54.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	7.5	208/60/1	24	93	1,2
UH-69	FUEL BAY	FUEL BAY	GAS FIRED	65.9	54.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	7.5	208/60/1	24	93	1,2
UH-70	FUEL BAY	FUEL BAY	GAS FIRED	65.9	54.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	7.5	208/60/1	24	93	1,2

UNIT HEATER SCHEDULE

TAG	SERVICE	LOCATION	TYPE	HEATING CAPACITY INPUT KW	HEATING CAPACITY OUTPUT KW	GAS SUPPLY PRESSURE Kpa	UNIT CONFIGURATION	MOUNTING HEIGHT M	ELECTRIC INFORMATION FLA (A)	ELECTRIC INFORMATION V/PH/HZ	CONTROL VOLTS	WEIGHT KG	NOTE
UH-71	DE-GREASE BAY	DE-GREASE BAY	GAS FIRED	73.3	60.8	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	7.5	208/60/1	24	98	1,2
UH-72	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	73.3	60.8	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	7.5	208/60/1	24	98	1,2
UH-73	MANEUVERING BAY	MANEUVERING BAY	GAS FIRED	73.3	60.8	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	7.5	208/60/1	24	98	1,2
UH-74	MAINTENANCE BAYS	MAINTENANCE BAYS	GAS FIRED	44	36.5	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	3.8	208/60/1	24	78	1,2
UH-75	MAINTENANCE BAYS	MAINTENANCE BAYS	GAS FIRED	44	36.5	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	3.8	208/60/1	24	78	1,2
UH-76	MAINTENANCE BAYS	MAINTENANCE BAYS	GAS FIRED	44	36.5	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	3.8	208/60/1	24	78	1,2
UH-77	MAINTENANCE BAYS	MAINTENANCE BAYS	GAS FIRED	44	36.5	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	3.8	208/60/1	24	78	1,2
UH-78	MAINTENANCE BAYS	MAINTENANCE BAYS	GAS FIRED	44	36.5	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	3.8	208/60/1	24	78	1,2
UH-79	MAINTENANCE BAYS	MAINTENANCE BAYS	GAS FIRED	44	36.5	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	3.8	208/60/1	24	78	1,2
UH-80	MAINTENANCE BAYS	MAINTENANCE BAYS	GAS FIRED	44	36.5	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	3.8	208/60/1	24	78	1,2
UH-81	MAINTENANCE BAYS	MAINTENANCE BAYS	GAS FIRED	44	36.5	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	3.8	208/60/1	24	78	1,2
UH-82	TOUCH UP BAY	TOUCH UP BAY	FORCED AIR ELEC	25	25	-	CELING MOUNTED	5	-	575/60/3	24	142	3,4
UH-83	TOUCH UP BAY	TOUCH UP BAY	FORCED AIR ELEC	25	25	-	CELING MOUNTED	5	-	575/60/3	24	142	3,4
UH-84	BODY SHOP	BODY SHOP	GAS FIRED	65.9	54.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	7.5	208/60/1	24	93	1,2
UH-85	BODY SHOP	BODY SHOP	GAS FIRED	65.9	54.7	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	7.5	208/60/1	24	93	1,2
UH-86	STOCKROOM 524	STOCKROOM 524	GAS FIRED	17.6	14.6	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	2.4	208/60/1	24	31	1,2
UH-87	VESTIBULE 525	VESTIBULE 525	GAS FIRED	17.6	14.6	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	2.4	208/60/1	24	31	1,2
UH-88	VESTIBULE 525	VESTIBULE 525	GAS FIRED	17.6	14.6	1.74 - 3.48	SEPARATED COMBUSTION AIR / VENT	5	2.4	208/60/1	24	31	1,2
UH-89	PUMP STORAGE	PUMP STORAGE	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	4
UH-90	HOT WATER ROOM	HOT WATER ROOM	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	4
UH-91	RECYCLE AREA	RECYCLE AREA	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	4
UH-92	RECYCLE AREA	RECYCLE AREA	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	4
UH-93	SPRINKLER ROOM	SPRINKLER ROOM	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	4
UH-94	SPRINKLER ROOM	SPRINKLER ROOM	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	4
UH-95	MECH. RM. 518	MECH. RM. 518	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	4
UH-96	PLANT MILLWRIGHTS SHOP	PLANT MILLWRIGHTS SHOP	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	4
UH-97	HAZMAT 1	HAZMAT 1	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	3,4
UH-98	HAZMAT 2	HAZMAT 2	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	3,4
UH-99	BOILER ROOM 219	BOILER ROOM	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	4
UH-100	SPLINKER ROOM 218	SPLINKER ROOM	FORCED AIR ELEC	5	5	-	CELING MOUNTED	5	-	208/60/3	24	142	4

NOTES:
1. C/W DOWNTURN NOZZLE AT 41° ANGLE
2. C/W VERTICAL VENT/COMBINATION AIR KIT
3. EXPLOSION PROOF
4. HORIZONTAL DISCHARGE

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Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
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APPROVED

McNICOLL BUS GARAGE

H.V.A.C SCHEDULES

Sheet 5 of 7

Plot Date: 06-24-2014

Dwg. No. G85-314-M564

Sheet No.

FAN SCHEDULE

TAG	SERVICE	LOCATION	TYPE	FLOW	ESP	FAN RPM	OPERATING POWER	MOTOR				SOUND DATA	WEIGHT	NOTES
								HP	RPM	DRIVE TYPE	ELECTRIC V/PH/HZ	dBA	KG	
				L/S	Pa		HP							
TB-1	SMALL SERVING BAY	SMALL SERVING BAY	TUBE AXIAL	9496	0	1725	2.76	3	1725	DIRECT	575/3/60	91	110	1,3
TB-2	SMALL SERVING BAY	SMALL SERVING BAY	TUBE AXIAL	9496	0	1725	2.76	3	1725	DIRECT	575/3/60	91	110	1,3
TB-3	SMALL SERVING BAY	SMALL SERVING BAY	TUBE AXIAL	9496	0	1725	2.76	3	1725	DIRECT	575/3/60	91	110	1,3
TB-4	SMALL SERVING BAY	SMALL SERVING BAY	TUBE AXIAL	9496	0	1725	2.76	3	1725	DIRECT	575/3/60	91	110	1,3
SF-5	BOILER ROOM	BOILER ROOM	CENTRIFUGAL INLINE	118	64	1550	0.03	1/30	1550	DIRECT	115/1/60	48.0	13.0	1
SF-6	COMPRESSOR ROOM	ROOF	LOUVERED ROOF SUPPLY	4009	127	2405	4.97	5	1725	3ELT	575/3/60	82.0	313.0	1,6
EF-1	VEHICLE EXHAUST	ROOF (articulated bay)	CENTRIFUGAL UTILITY	1509	1194	2277	3.85	5	1725	3ELT	575/3/60	74	126	1,3,5
EF-2	VEHICLE EXHAUST	ROOF (articulated bay)	CENTRIFUGAL UTILITY	1509	1194	2277	3.85	5	1725	3ELT	575/3/60	74	126	1,3,5
EF-3	VEHICLE EXHAUST	ROOF (articulated bay)	CENTRIFUGAL UTILITY	755	1194	3349	2.04	2	1725	3ELT	575/3/60	73	78	1,3,5
EF-4	VEHICLE EXHAUST	ROOF (stand. Maint. bay)	CENTRIFUGAL UTILITY	1509	1194	2277	3.85	5	1725	3ELT	575/3/60	74	126	1,3,5
EF-5	VEHICLE EXHAUST	ROOF (stand. Maint. bay)	CENTRIFUGAL UTILITY	1132	1194	2839	2.82	3	1725	3ELT	575/3/60	75	105	1,3,5
EF-6	PAINT BOOTH	ROOF	CENTRIFUGAL UTILITY	19811	508	701	28.08	30	1725	3ELT	575/3/60	82	994	1,3
EF-7	BATTERY STORAGE	ROOF	CENTRIFUGAL UTILITY	613	191	1975	0.44	1/2	1725	3ELT	115/1/60	68	68	1,2
EF-8	HAZARD 1	ROOF	CENTRIFUGAL UTILITY	47	127	1273	0.06	1/4	1725	3ELT	115/1/60	53	64	1,2,4
EF-9	HAZARD 2	ROOF	CENTRIFUGAL UTILITY	47	127	1273	0.06	1/4	1725	3ELT	115/1/60	53	64	1,2,4
EF-10	MECH ROOM 518	ROOF	CENTRIFUGAL ROOF	142	127	1155	0.08	1/6	1725	3ELT	115/1/60	50	26	1
EF-11	MILLRIGHTS SHOP	ROOF	CENTRIFUGAL ROOF	118	127	1562	0.12	1/6	1725	3ELT	115/1/60	57	26	1
EF-12	RECYCLE WASH	ROOF	CENTRIFUGAL ROOF	436	127	1563	0.22	1/4	1725	3ELT	115/1/60	61	26	1
EF-13	WATER TANK	ROOF	CENTRIFUGAL ROOF	101	127	1444	0.1	1/6	1725	3ELT	115/1/60	54	26	1
EF-14	PUMP RM	ROOF	CENTRIFUGAL ROOF	101	127	1444	0.1	1/6	1725	3ELT	115/1/60	54	26	1
EF-16	SPRINKLER ROOM	ROOF	CENTRIFUGAL ROOF	290	127	1556	0.17	1/6	1725	3ELT	115/1/60	59	26	1
EF-17	WASH FLUID COLLECTION	ROOF	CENTRIFUGAL ROOF	137	165	1273	0.09	1/6	1725	3ELT	115/1/60	52	26	1
EF-18	COMPRESSOR ROOM	ROOF	CENTRIFUGAL ROOF	4009	127	746	2.22	3	1725	3ELT	575/3/60	68	80	1
EF-19	PAINT PREP AREA 509 /PAINT MIX RM 510	ROOF	CENTRIFUGAL UTILITY	377	191	2162	0.33	1/3	1725	3ELT	115/1/60	66	65.4	1,3
EF-20	CIS CONTRAL AREA EXHAUST	ROOF	CENTRIFUGAL INLINE	129	191	1498	0.15	1/4	1725	3ELT	115/1/60	58	44	1,2,7,8,9
EF-21	L1 OFFICE WR EXHAUST	ROOF	CENTRIFUGAL INLINE	152	191	1542	0.17	1/4	1725	3ELT	115/1/60	60	37.2	1,2,7,8,9
EF-22	SE OFFICE WASHROOM	ROOF	CENTRIFUGAL ROOF	170	127	1208	0.09	1/6	1725	3ELT	115/1/60	51	25.9	1
EF-23	VEHICLE EXHAUST	ROOF	CENTRIFUGAL UTILITY	377	1067	3350	1.1	1 1/2	1725	3ELT	575/3/60	72	74.5	1,3,5
EF-24	TELECOM ROOM 714	ROOF	CENTRIFUGAL ROOF	118	127	1562	0.12	1/6	1725	3ELT	115/1/60	57	25.9	1
EF-25	TELECOM ROOM 809	ROOF	CENTRIFUGAL ROOF	118	127	1562	0.12	1/6	1725	3ELT	115/1/60	57	25.9	1
EF-26	SPRINKLER ROOM 218	SPRINKLER ROOM	CENTRIFUGAL INLINE	118	64	1550	0.03	1/30	1550	DIRECT	115/1/60	48.0	13.0	1
WEF-1	BODY SHOP	BODY SHOP	CENTRIFUGAL FAN	222	1300	-	1.2	1.5	3460	DIRECT	480/3/60	-	17	1,4,10
WEF-2	BODY SHOP	BODY SHOP	CENTRIFUGAL FAN	222	1300	-	1.2	1.5	3460	DIRECT	480/3/60	-	17	1,4,10

NOTES:
1. MOTOR W/ CSA APPROVAL
2. ALUMINUM WHEEL MATERIAL
3. CORROSION RESISTANT GALVANIZED STEEL HOUSING
4. SPARK PROOF CONSTRUCTION AND MOTOR OUT OF AIR STREAM
5. OPERATION ON VFD
6. 50MM WASHABLE ALUMINUM FILTER
7. C/W BACKDRAFT DAMPER
8. C/W MOTOR COVER
9. SPRING HANGING ISOLATORS & BRACKETS
10. EPOXIPOLYESTER POWDER PAINT, DIE CAST ALUMINUM IMPELLER

PUMP SCHEDULE

TAG	SERVICE	LOCATION	TYPE	FLOW	HEAD	FLUID	POWER	MOTOR			NOTES
								POWER	RPM	ELECTRIC V/PH/HZ	
				l/s	kPa		BHP	HP			
P-1	B-1	BOILER ROOM 219	IN-LINE	2.30	128	WATER	0.58	1.0	1725	575/3/60	
P-2	B-2	BOILER ROOM 219	IN-LINE	2.30	128	WATER	0.58	1.0	1725	575/3/60	
P-3	REHEAT COIL	BOILER ROOM 219	IN-LINE	1.33	128	WATER	0.49	1.0	1725	575/3/60	
P-4	REHEAT COIL	BOILER ROOM 219	IN-LINE	1.33	128	WATER	0.49	1.0	1725	575/3/60	

NOTES:

GAS-FIRED HOT WATER HEATER SCHEDULE

TAG	TYPE	SERVICE	LOCATION	INPUT	OUTPUT (SEE NOTE 6)	THERMAL EFFICIENCY	RECOVERY FLOW	TEMPERATURE RISE	FUEL	NATURAL GAS SUPPLY PRESSURE	NATURAL GAS CONSUMPTION	MAX. OPERATING WEIGHT	NOTES
				Kw	Kw	%	L/h	°C		kPa	M^3/HR	KG	
HW"-1	HIGH EFF. CONDENSING	DOMESTIC WATER	HOT WATER TANK ROOM 818	83.5	79.8	95.6	409	44	NATURAL GAS	1.25	8.07	125	1,2,3,4,5,6
HW"-2	HIGH EFF. CONDENSING	DOMESTIC WATER	HOT WATER TANK ROOM 818	58.3	56.6	97.0	286	44	NATURAL GAS	1.25	5.63	112	1,2,3,4,5,6
HW"-3	HIGH EFF. CONDENSING	DOMESTIC WATER	BOILER ROOM 219	83.5	79.8	95.6	409	44	NATURAL GAS	1.25	8.07	125	1,2,3,4,5,6

NOTES:
1. HIGH EFFICIENCY CONDENSING S/S HEAT EXCHANGER
2. 5:1 TURNDOWN
3. SEALED COMBUSTION CHAMBER
4. PRE-MIX STAINLESS STEEL BURNER
5. DIRECT VENTING AIR INTAKE AND FLUE DISCHARGE PIPE PACKAGE

GAS-FIRED INFRA RAD HEATERS SCHEDULE

TAG	SERVICE	TYPE	HEATING TUBE					REFLECTOR		TYP. MOUNTING HEIGHT	TYP. MOUNTING ANGLE	SURFACE TEMPERATURE	SELECTION CRITERIA						T'STAT	ELECTRIC INFORMATION						CONTROL			WEIGHT	NOTE
			MATERIAL	RADIANT EMITTER	NO. OF BAFFELS	TUBE LENGTH	SURFACE AREA	MATERIAL	SIDE S-HIELD				HEATING			FLUE VENT				TYPE	MOTOR SIZE	MOTOR SPEED	FLA TOTAL	VOLTAGE	INTERLOCK TYPE		CONTROL VOLTS		
													INPUT	GAS PRESSURE	COMBUSTION AIR INTAKE DIA.	DIA.	TYPE	BURNER LOCATION						PHYSICAL	BACS			
						M	M^2		YES/NO	M	°	°C	KW	kPa	mm	mm			YES/NO		KW	RPM	A	V/PH/HZ	YES/NO	YES/NO		KG	
IRH-1	REPAIR BAY	HIGH-INTENSITY INFRARED	-	-	-	-	15.8	ALUMINUM	NO	5.3	20	904	13	1.74 - 3.48	-	-	-	-	YES	-	-	-	0.48	24/1/60	NO	YES	24	12	1,2,3,4,5,6
IRH-2	REPAIR BAY	HIGH-INTENSITY INFRARED	-	-	-	-	15.8	ALUMINUM	NO	5.3	20	904	13	1.74 - 3.48	-	-	-	-	YES	-	-	-	0.48	24/1/60	NO	YES	24	12	1,2,3,4,5,6
IRH-3	REPAIR BAY	HIGH-INTENSITY INFRARED	-	-	-	-	15.8	ALUMINUM	NO	5.3	20	904	13	1.74 - 3.48	-	-	-	-	YES	-	-	-	0.48	24/1/60	NO	YES	24	12	1,2,3,4,5,6
IRH-4	REPAIR BAY	HIGH-INTENSITY INFRARED	-	-	-	-	15.8	ALUMINUM	NO	5.3	20	904	13	1.74 - 3.48	-	-	-	-	YES	-	-	-	0.48	24/1/60	NO	YES	24	12	1,2,3,4,5,6
IRH-5	REPAIR BAY	HIGH-INTENSITY INFRARED	-	-	-	-	15.8	ALUMINUM	NO	5.3	20	904	13	1.74 - 3.48	-	-	-	-	YES	-	-	-	0.48	24/1/60	NO	YES	24	12	1,2,3,4,5,6
IRH-6	REPAIR BAY	HIGH-INTENSITY INFRARED	-	-	-	-	15.8	ALUMINUM	NO	5.3	20	904	13	1.74 - 3.48	-	-	-	-	YES	-	-	-	0.48	24/1/60	NO	YES	24	12	1,2,3,4,5,6
IRH-7	REPAIR BAY	HIGH-INTENSITY INFRARED	-	-	-	-	15.8	ALUMINUM	NO	5.3	20	904	13	1.74 - 3.48	-	-	-	-	YES	-	-	-	0.48	24/1/60	NO	YES	24	12	1,2,3,4,5,6
IRH-8	REPAIR BAY	HIGH-INTENSITY INFRARED	-	-	-	-	15.8	ALUMINUM	NO	5.3	20	904	13	1.74 - 3.48	-	-	-	-	YES	-	-	-	0.48	24/1/60	NO	YES	24	12	1,2,3,4,5,6
IRH-9	DEGREASE ROOM	LOW-INTENSITY INFRARED	S.S.	S.S.	4	15418	4.8	S.S.	YES	4.9	0	-	36.6	1.74 - 3.48	100	100	S.S.	-	YES	-	-	-	4.8	115/1/60	NO	NO	115	132	1,2,3,4,5,6
IRH-10	DEGREASE ROOM	LOW-INTENSITY INFRARED	S.S.	S.S.	4	15418	4.8	S.S.	YES	4.9	0	-	36.6	1.74 - 3.48	100	100	S.S.	-	YES	-	-	-	4.8	115/1/60	NO	NO	115	132	1,2,3,4,5,6

NOTES:
1. CONTROL BOX AND TUBE IS STAINLESS STEEL CONSTRUCTION
2. EMITTER & COMBUSTION TUBES INCLUDES NO. OF STAGES
3. REFLECTOR, ENCLOSURE AND MOUNTING BRACKETS
4. REFER TO MANUFACTURER'S INSTRUCTION FOR MINIMUM CLEARANCE TO COMBUSTIBLES
5. UNIT ON/OFF CONTROL BY BAS
6. REFER TO SPECIFICATION FOR FURTHER DETAILS

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McNICOLL BUS GARAGE

H.V.A.C SCHEDULES

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Dwg. No. G85-314-M565

Sheet No.

AIR CURTAIN SCHEDULE

TAG	SERVICE	FAN				SELECTION CRITERIA									OPERATING POINT			ELECTRICAL DATA	EQUIPMENT INTERLOCKS		CONTROL	WEIGHT	REMARKS
		APPLICATION	TYPE	DRIVE	ARRANGEMENT	NOZZLE				CURTAIN		DOOR SIZE			AIR FLOW	FAN SPEED	BRAKE POWER	MOTOR SIZE	VOLTAGE	UNIT TAG	PHYSICAL INTERLOCKS			
						WIDTH	FLOW	MAX. VEL.	AVG. VEL.	CORE VEL.	DIST. FROM NOZZ.	WIDTH	HEIGHT	MAX. dBA AT 3.0 m									
						mm	L/s	m/s		m/s	m	mm	mm		L/s	rpm	Kw	Kw	V/PH/HZ			Kg	
ACR-1		AIR CURTAIN	CENTRIFUGAL	DIRECT	FRONT INTAKE BOTTOM DSCHARGE	3658	6164	22.9	15.6	6.37	3.96	4.2	4.3	68	6164	1160	-	5.59	600/3/60		YES	-	361	1,2,3,4,5,6
ACR-2		AIR CURTAIN	CENTRIFUGAL	DIRECT	FRONT INTAKE BOTTOM DSCHARGE	3658	6164	22.9	15.6	6.37	3.96	4.2	4.3	68	6164	1160	-	5.59	600/3/60		YES	-	361	1,2,3,4,5,6
ACR-3		AIR CURTAIN	CENTRIFUGAL	DIRECT	FRONT INTAKE BOTTOM DSCHARGE	3658	6164	22.9	15.6	6.37	3.96	4.2	4.3	68	6164	1160	-	5.59	600/3/60		YES	-	361	1,2,3,4,5,6
ACR-4		AIR CURTAIN	CENTRIFUGAL	DIRECT	FRONT INTAKE BOTTOM DSCHARGE	3658	6164	22.9	15.6	6.37	3.96	4.2	4.3	68	6164	1160	-	5.59	600/3/60		YES	-	361	1,2,3,4,5,6
ACR-5		AIR CURTAIN	CENTRIFUGAL	DIRECT	FRONT INTAKE BOTTOM DSCHARGE	3658	6164	22.9	15.6	6.37	3.96	4.2	4.3	68	6164	1160	-	5.59	600/3/60		YES	-	361	1,2,3,4,5,6
ACR-6		AIR CURTAIN	CENTRIFUGAL	DIRECT	FRONT INTAKE BOTTOM DSCHARGE	3658	6164	22.9	15.6	6.37	3.96	4.2	4.3	68	6164	1160	-	5.59	600/3/60		YES	-	361	1,2,3,4,5,6
ACR-7		AIR CURTAIN	CENTRIFUGAL	DIRECT	FRONT INTAKE BOTTOM DSCHARGE	3658	6164	22.9	15.6	6.37	3.96	4.2	4.3	68	6164	1160	-	5.59	600/3/60		YES	-	361	1,2,3,4,5,6
ACR-8		AIR CURTAIN	CENTRIFUGAL	DIRECT	FRONT INTAKE BOTTOM DSCHARGE	3658	6164	22.9	15.6	6.37	3.96	4.2	4.3	68	6164	1160	-	5.59	600/3/60		YES	-	361	1,2,3,4,5,6

NOTES:
1. CURTAIN VELOCITY AT DISTANCE FROM DISCHARGE NOZZLE
2. ADJUST MOTOR SIZE TO SUIT FINAL SELECTION FOR LISTED CRITERIA
3. INCLUDES ALLOWANCE FOR DUCT ARRANGEMENT SYSTEM EFFECTS
4. FINAL MOTOR ELECTRICAL DATA TO BE COORDINATED WITH MOTOR STARTER
5. INVERTER DUTY MOTOR, SUIT FOR VFD.
6. REFER TO SPCIFICATION FOR FURTHER DETAILS

SPLIT AIR CONDITIONERS SCHEDULE

TAG		SERVICE	LOCATION		TYPE	COOLING CAPACITY	REFRIGERANT	DESIGN AMBIENT	ELECTRIC MCA			REMARKS
OUTDOOR	INDOOR		OUTDOOR	INDOOR		(KW:		(°C)	OUTDOOR	INDOOR	V/PH/HZ	
AC-OD-1	AC-ID-1	ELECT/MCC 02 (229)	ROOF	ELECT/MCC 02 (229)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	7.03	R410a	-10 ~ 46			208/1/60	
AC-OD-2	AC-ID-2	TELECOM ROOM 03 (228)	ROOF	TELECOM ROOM 03 (228)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	7.03	R410a	-10 ~ 46			208/1/60	
AC-OD-3	AC-ID-3	LAN ROOM (220)	ROOF	LAN ROOM (220)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	7.03	R410a	-10 ~ 46			208/1/60	
AC-OD-4	AC-ID-4	LAN ROOM 02 (808)	ROOF	LAN ROOM 02 (808)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	3.52	R410a	-10 ~ 46			208/1/60	
AC-OD-5	AC-ID-5	MCC ROOM (807)	ROOF	MCC ROOM (807)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	7.03	R410a	-10 ~ 46			208/1/60	
AC-OD-6	AC-ID-6	MAIN ELECTRICAL RM (710)	ROOF	MAIN ELECTRICAL RM (710)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	10.6	R410a	-10 ~ 46			208/1/60	
AC-OD-7	AC-ID-7	MAIN TEL. ROOM (713)	ROOF	MAIN TEL. ROOM (713)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	7.03	R410a	-10 ~ 46			208/1/60	
AC-OD-8-1	AC-ID-8-1	UPS (711)	ROOF	UPS (711)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	10.6	R410a	-10 ~ 46			208/1/60	DUTY/ STAND-BY
AC-OD-8-2	AC-ID-8-2	UPS (711)	ROOF	UPS (711)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	10.6	R410a	-10 ~ 46			208/1/60	DUTY/ STAND-BY
AC-OD-9-1	AC-ID-9-1	ELEVATOR MACHINE ROOM (241)	ROOF	ELEVATOR MACHINE ROOM (241)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	7.03	R410a	-10 ~ 46			208/1/60	DUTY/ STAND-BY
AC-OD-9-2	AC-ID-9-2	ELEVATOR MACHINE ROOM (241)	ROOF	ELEVATOR MACHINE ROOM (241)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	7.03	R410a	-10 ~ 46			208/1/60	DUTY/ STAND-BY
AC-OD-10	AC-ID-10	MCC ROOM (517)	ROOF	MCC ROOM (517)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	10.6	R410a	-10 ~ 46	20	1.5HP	208/1/60	
AC-OD-11	AC-ID-11	MCC ROOM (516)	ROOF	MCC ROOM (516)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	3.52	R410a	-10 ~ 46	13	1	208/1/60	
AC-OD-12	AC-ID-12	MCC ROOM (515)	ROOF	MCC ROOM (515)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	3.52	R410a	-10 ~ 46	13	1	208/1/60	
AC-OD-13	AC-ID-13	STOCK ROOM SUPERVISOR (527)	ROOF	STOCK ROOM SUPERVISOR (527)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	3.52	R410a	-10 ~ 46	13	1	208/1/60	
AC-OD-14	AC-ID-14	SENIOR STORE PERSONS OFFICE (526)	ROOF	SENIOR STORE PERSONS OFFICE (526)	AIR COOLED, SPLIT SYSTEM, COOLING ONLY	3.52	R410a	-10 ~ 46	13	1	208/1/60	

NOTES:
1. DUCTED CEILING-CONCEALED
2. WIRED REMOTED CONTROLLER
3. C/W PRE-CHAREGED REFRIGERANT PIPE, CONFIRM PIPE LENGTH PRIOR TO ORDERING

PORTABLE WELDING EXHAUST SYSTEM SCHEDULE

TAG	LOCATION	TYPE	AIR FLOW	PRESSURE	HOSE LENGTH	HOSE CONNECTION	FILTER TYPE	TABLE DIMENSION	MOTOR	ELECTRICAL	NOISE	NOTES
			L/s	Kpa	mm	mm DIA		H x W x D mm		V/PH/HZ	DBA	
PWEX-1	BODY SHOP	SINGLE EXTRACTION	26 - 54	18 - 23	2400	45	POLYESTER	340 X 680 X 400	15 A	115/1/60	74	1,2,3,4,5
PWEX-2	BODY SHOP	SINGLE EXTRACTION	26 - 54	18 - 23	2400	45	POLYESTER	340 X 680 X 400	15 A	115/1/60	74	1,2,3,4,5
PWEX-3	BODY SHOP	SINGLE EXTRACTION	566	1.3	3000		CARTRIDGE, SPARK RESISTANT	978 X 1252 X 921	3 HP, 8.4A	208//3/60	75	4,5,6,7,9
PWEX-4	BODY SHOP	SINGLE EXTRACTION	566	1.3	3000		CARTRIDGE, SPARK RESISTANT	978 X 1252 X 921	3 HP, 8.4A	208//3/60	75	4,5,6,7,9

NOTES:
1. ROTARY AIR JET SYSTEM FOR FILTER CLEAN USING COMPRESSED AIR
2. AUTOMATIC START/STOP SENSOR TO PROVIDE EXTRACTION ONLY WHEN NEEDED
3. ACCESSORIES: TBD
4. COMPRESSED AIR PROVIDED BY OTHERS
5. VIBRA-PULSE FILTER CLEAN
6. PRESSURE GAUGE KIT INDICATES FILTER CHANGES
7. SILENCER
8. SELF-CLEANING MECHANISM
9. HEPA FILTER (99.97%)

BLDG. REF. No.
FILE: STN_81s_hv_acd_07.dgn
SHEET No.
DRAWING No. G85-314-M566

REVISIONS	REVISIONS

SCOPE REVIEW DRAWING
NOT FOR CONSTRUCTION

SCALE(S)

Stantec HDR

DESIGNED V. JOSHI 2014/05/15
DRAWN S. CHUNG 2014/05/15
CHECKED P. MARSH 2014/06/13
APPROVED

McNICOLL BUS GARAGE

H.V.A.C SCHEDULES

Sheet 7 of 7

Plot Date: 08-27-2014

Dwg. No. G85-314-M566

Sheet No.

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for 2-sided printing purposes

Appendix D

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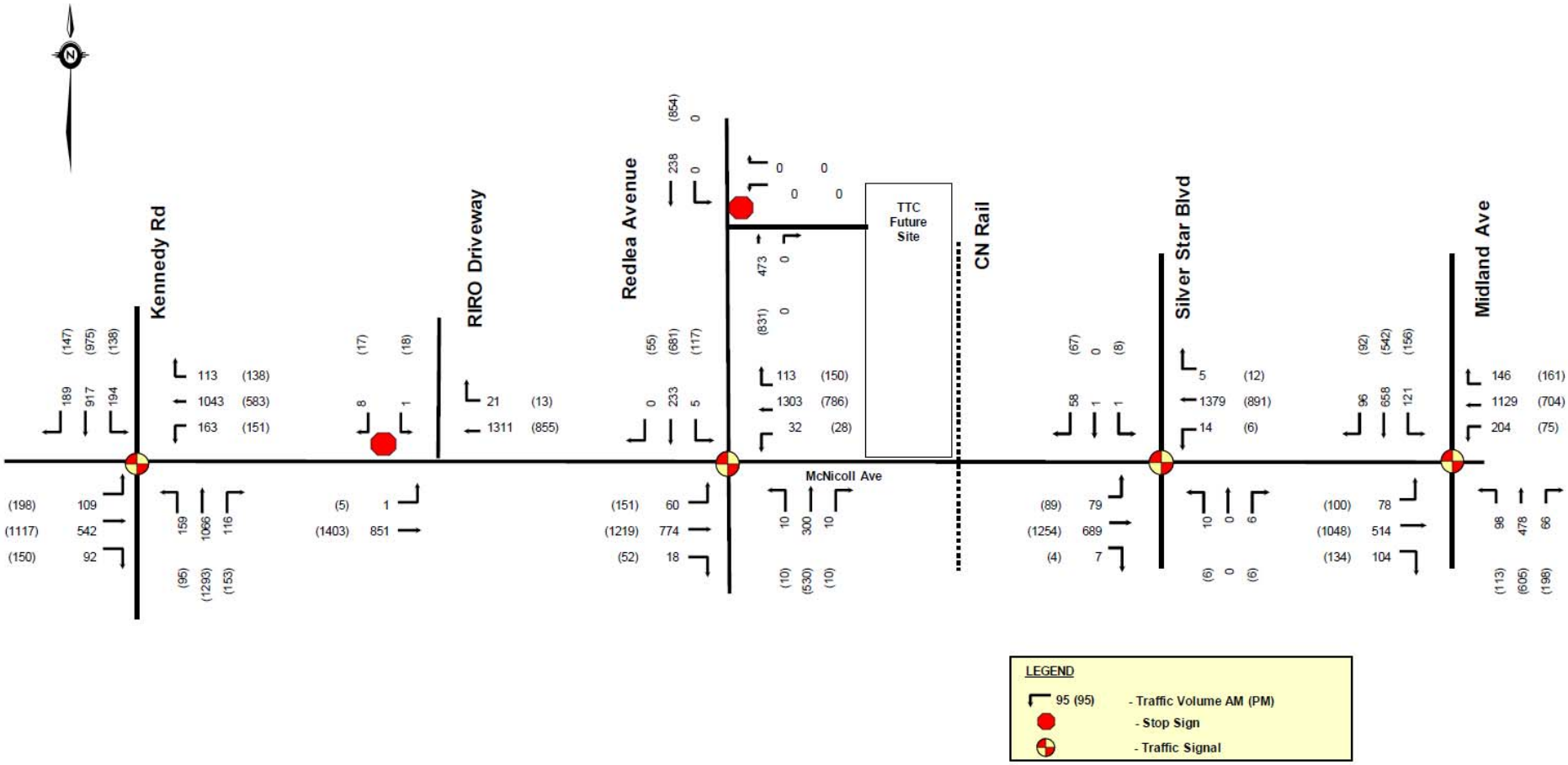
for 2-sided printing purposes

FIGURE 4-1 – FUTURE BACKGROUND TRAFFIC VOLUMES, A.M. & P.M. PEAK HOUR



O R N A M E N T - Sound Power Emissions & Source Heights

Ontario Road Noise Analysis Method for Environment and Transportation

Roadway	Time Period	% AADT [1]	Speed (kph)	Period (h)	Total Traffic Volumes [2]	Auto [1] %	Med [1] %	Hvy [1] %	Auto	Med	Heavy	Road Gradient (%)	Cadna/A Ground Absorption G	PWL (dBA)	Source Height, s (m)
Kennedy	AADT		60	24	28890	95.8%	2.3%	2.0%	27668	654	568	0	0.00	**83.7**	**1.2**
Kennedy	min 3am	0.38%	60	1	109	95.8%	2.3%	2.0%	105	2	2	0	0.00	**73.3**	**1.2**
Kennedy	min 6am	1.95%	60	1	564	95.8%	2.3%	2.0%	541	13	11	0	0.00	**80.4**	**1.2**
Kennedy	min day	4.30%	60	1	1244	95.8%	2.3%	2.0%	1191	28	24	0	0.00	**83.8**	**1.2**
Redlea	AADT		50	24	16840	95.8%	2.3%	2.0%	16127	381	331	0	0.00	**79.6**	**1.2**
Redlea	min 3am	0.38%	50	1	64	95.8%	2.3%	2.0%	61	1	1	0	0.00	**69.2**	**1.2**
Redlea	min 6am	1.95%	50	1	329	95.8%	2.3%	2.0%	315	7	6	0	0.00	**76.4**	**1.2**
Redlea	min day	4.30%	50	1	725	95.8%	2.3%	2.0%	694	16	14	0	0.00	**79.8**	**1.2**
McNicoll	AADT		50	24	22800	95.8%	2.3%	2.0%	21835	516	448	0	0.00	**81.0**	**1.2**
McNicoll	min 3am	0.38%	50	1	86	95.8%	2.3%	2.0%	83	2	2	0	0.00	**70.6**	**1.2**
McNicoll	min 6am	1.95%	50	1	445	95.8%	2.3%	2.0%	427	10	9	0	0.00	**77.7**	**1.2**
McNicoll	min day	4.30%	50	1	981	95.8%	2.3%	2.0%	940	22	19	0	0.00	**81.1**	**1.2**
Midland	AADT		50	24	16560	95.8%	2.3%	2.0%	15859	375	326	0	0.00	**79.6**	**1.2**
Midland	min 3am	0.38%	50	1	63	95.8%	2.3%	2.0%	60	1	1	0	0.00	**69.2**	**1.2**
Midland	min 6am	1.95%	50	1	324	95.8%	2.3%	2.0%	310	7	6	0	0.00	**76.3**	**1.2**
Midland	min day	4.30%	50	1	713	95.8%	2.3%	2.0%	683	16	14	0	0.00	**79.7**	**1.2**

Note: [1] from avg Toronto Traffic data

[2] from URS TTC McNicoll Bus Garage Traffic Impact Study (assuming AADT = Peak PM * 10)

Example Change Assessment

O R N A M E N T - Sound Level Emissions Calculations

Ontario Road Noise Analysis Method for Environment and Transportation

Roadway	Time Period	% AADT [1]	Speed (kph)	Period (h)	Total Traffic Volumes [2]	Auto [1] %	Med [1] %	Hvy [1] %	Auto	Med	Heavy	Road Gradient (%)	Reference Leq (dBA)
Redlea	AADT		50	24	16840	95.8%	2.3%	2.0%	16127	381	331	0	**64.6**
Redlea	day	90%	50	16	15156	95.8%	2.3%	2.0%	14515	343	298	0	**65.9**
Buses	TOTAL Movements (220 buses)		50	24	591	0.0%	100.0%	0.0%	0	591	0	0	**57.7**
Buses	day		50	16	305	0.0%	100.0%	0.0%	0	305	0	0	**56.6**

Note: [1] from avg Toronto Traffic data

[2] from URS TTC McNicoll Bus Garage Traffic Impact Study (assuming AADT = Peak PM * 10)

INCREASE IN NOISE FROM REDLEA **24hr** **0.8 dB**

day **0.5 dB**

Comparison of STAMSON and Cadna/A Modelling

Cadna/A Receptor Location

X	17636747.8
Y	4852541.8
Z	12.5

Time	Modelled Traffic Noise (dBA)	
	STAMSON	**Cadna/A**
Daytime Min	64	63
3am	53	53
6am	61	60

STAMSON 5.0 NORMAL REPORT Date: 10-11-2014 15:57:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: NE_day.te Time Period: 1 hours
Description:

Road data, segment # 1: Redlea

Car traffic volume : 694 veh/TimePeriod
Medium truck volume : 16 veh/TimePeriod
Heavy truck volume : 14 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Redlea

Angle1 Angle2 : -90.00 deg 75.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 m
Receiver height : 12.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: McNicoll

Car traffic volume : 940 veh/TimePeriod
Medium truck volume : 22 veh/TimePeriod
Heavy truck volume : 19 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: McNicoll

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 64.00 m
Receiver height : 12.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Redlea

Source height = 1.18 m

ROAD (0.00 + 63.60 + 0.00) = 63.60 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	75	0.34	64.67	0.00	0.00	-1.07	0.00	0.00	0.00	63.60

Segment Leq : 63.60 dBA

Results segment # 2: McNicoll

Source height = 1.18 m

ROAD (0.00 + 56.69 + 0.00) = 56.69 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	66.00	0.00	-6.30	-3.01	0.00	0.00	0.00	56.69

Segment Leq : 56.69 dBA

Total Leq All Segments: 64.41 dBA

TOTAL Leq FROM ALL SOURCES: 64.41

STAMSON 5.0 NORMAL REPORT Date: 10-11-2014 15:59:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: NE_3am.te Time Period: 1 hours
Description:

Road data, segment # 1: Redlea

Car traffic volume : 61 veh/TimePeriod
Medium truck volume : 1 veh/TimePeriod
Heavy truck volume : 1 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Redlea

Angle1 Angle2 : -90.00 deg 75.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 m
Receiver height : 12.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: McNicoll

Car traffic volume : 83 veh/TimePeriod
Medium truck volume : 2 veh/TimePeriod
Heavy truck volume : 2 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: McNicoll

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 64.00 m
Receiver height : 12.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Redlea

Source height = 1.12 m

ROAD (0.00 + 52.44 + 0.00) = 52.44 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	75	0.34	53.51	0.00	0.00	-1.07	0.00	0.00	0.00	52.44

Segment Leq : 52.44 dBA

Results segment # 2: McNicoll

Source height = 1.23 m

ROAD (0.00 + 46.55 + 0.00) = 46.55 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	55.86	0.00	-6.30	-3.01	0.00	0.00	0.00	46.55

Segment Leq : 46.55 dBA

Total Leq All Segments: 53.44 dBA

TOTAL Leq FROM ALL SOURCES: 53.44

STAMSON 5.0 NORMAL REPORT Date: 10-11-2014 16:01:06
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: NE_6am.te Time Period: 1 hours
Description:

Road data, segment # 1: Redlea

Car traffic volume : 315 veh/TimePeriod
Medium truck volume : 7 veh/TimePeriod
Heavy truck volume : 6 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 1: Redlea

Angle1 Angle2 : -90.00 deg 75.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 1 (Absorptive ground surface)
Receiver source distance : 15.00 m
Receiver height : 12.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Road data, segment # 2: McNicoll

Car traffic volume : 427 veh/TimePeriod
Medium truck volume : 10 veh/TimePeriod
Heavy truck volume : 9 veh/TimePeriod
Posted speed limit : 50 km/h
Road gradient : 0 %
Road pavement : 1 (Typical asphalt or concrete)

Data for Segment # 2: McNicoll

Angle1 Angle2 : -90.00 deg 0.00 deg
Wood depth : 0 (No woods.)
No of house rows : 0
Surface : 2 (Reflective ground surface)
Receiver source distance : 64.00 m
Receiver height : 12.50 m
Topography : 1 (Flat/gentle slope; no barrier)
Reference angle : 0.00

Results segment # 1: Redlea

Source height = 1.16 m

ROAD (0.00 + 60.03 + 0.00) = 60.03 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	75	0.34	61.10	0.00	0.00	-1.07	0.00	0.00	0.00	60.03

Segment Leq : 60.03 dBA

Results segment # 2: McNicoll

Source height = 1.19 m

ROAD (0.00 + 53.35 + 0.00) = 53.35 dBA

Angle1	Angle2	Alpha	RefLeq	P.Adj	D.Adj	F.Adj	W.Adj	H.Adj	B.Adj	SubLeq
-90	0	0.00	62.66	0.00	-6.30	-3.01	0.00	0.00	0.00	53.35

Segment Leq : 53.35 dBA

Total Leq All Segments: 60.87 dBA

TOTAL Leq FROM ALL SOURCES: 60.87

Wang, Joanne

To: Marcello.Favaro@ttc.ca; Occhiogrosso, Leonard
Subject: RE: TPH Comment McNicoll Bus Garage EPR (Noise)

From: Howard Shapiro [mailto:hshapir@toronto.ca]
Sent: Tuesday, December 23, 2014 4:41 PM
To: Solange.Desautels@ontario.ca; Barbara Lachapelle; MacDonald, Jason; Dimovski, John
Cc: David McKeown; Jann Houston; Reg Ayre; Nagler, David; Romano, Lito; Favaro, Marcello
Subject: TPH Comment McNicoll Bus Garage EPR (Noise)

Hi John,

The following are TPH's comments with respect to the evaluation of noise from the proposed facility at McNicoll. Please contact myself or Barbara Lachapelle if you have any questions.

There is a growing body of evidence that noise at certain levels could result in health effects such as hearing impairment, sleep disturbance, cardiovascular disease, and annoyance. In the past (i.e. Billy Bishop Toronto City Airport Health Impact Assessment study) TPH used a variety of noise benchmarks representing different health endpoints to assess potential health impacts. These benchmarks have been developed by organizations such as the World Health Organization (WHO), Health Canada (HC) and the Health Council of the Netherlands. As many of these endpoint are especially relevant to sensitive receptors such as the elderly, we recommend the use of the same benchmarks for the McNicoll noise quality assessment.

Health Effect	Threshold/Guideline	Reference
Environmental insomnia	42 $L_{Aeq,\ 8hr}$ (23-07 hr)	WHO. 2009
Sleep disturbance, outside bedrooms	45 $L_{Aeq,\ 8hr}$ (23-07 hr)	WHO. 1999b
Sleep disturbance, night noise guideline	40 $L_{Aeq,\ 8hr}$ (23-07 hr)	WHO, 2009
Sleep disturbance, interim target	55 $L_{Aeq,\ 8hr}$ (23-07 hr)	WHO, 2009
Hypertension	70 $L_{Aeq,\ 16hr}$ (06-22 hr)	Health Council of the Netherlands, 1999
Ischemic health disease	70 $L_{Aeq,\ 16hr}$ (06-22 hr)	Health Council of the Netherlands, 1999
Sleep pattern	< 60 $L_{Aeq,\ 8hr}$ (23-07 hr)	Passchier-Vermeer and Passchier, 2000
Subjective sleep quality	40 $L_{Aeq,\ 8hr}$ (23-07 hr)	Health Council of the Netherlands, 1999
Mood next day	< 60 $L_{Aeq,\ 8hr}$ (23-07 hr)	Health Council of the Netherlands, 1999
Increased avg. movement during sleep	42 $L_{Aeq,\ 8hr}$ (23-07 hr)	WHO, 2009
Self-reported sleep disturbance	42 $L_{Aeq,\ 8hr}$ (23-07 hr)	WHO, 2009
Use of sleep-aid drugs and sedatives	42 $L_{Aeq,\ 8hr}$ (23-07 hr)	WHO, 2009
Moderate annoyance, outdoor living area	50 $L_{Aeq,\ 16hr}$	WHO, 1999b
Serious annoyance, outdoor living area	55 $L_{Aeq,\ 16hr}$	WHO, 1999b
Annoyance, difference between baseline and project	>6.5% difference in %HA	Health Canada, 2010

The background and the rationale for the use of the various benchmarks is outlined in the BBTCA Health Impact Assessment, here's the link:
http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=06917b805ebe1410VgnVCM10000071d60f89RCRD

It is listed under Golder Associates (approx. halfway down the page).

References

Health Canada. 2010. Useful Information for Environmental Assessments.
Health Council of the Netherlands. 1999. Public health impacts of large airports.
Passchier-Vermeer, W., Passchier, W.F. 2000. Noise exposure and public health. Environmental Health Perspectives, 108(1), 123-131.
WHO. 1999b. Guideline for Community Noise. Edited by B. Berglund, T. Lindvall and D.H. Schwela. Geneva.
WHO. 2009. Night noise guidelines for Europe

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January 27, 2015

AECOM
4th Floor, 30 Leek Crescent
Richmond Hill, ON
L4B 4N4

Attn: Mrs .Joanne Wang joanne.wang@aecom.com

Re: TTC McNicoll Bus Garage
Responses to Toronto Public Health Noise Health Questions
Novus File: 13-0054

Novus Environmental Inc. (Novus) was retained by AECOM on behalf of the Toronto Transit Commission (TTC) to prepare an environmental noise assessment for the proposed McNicoll Bus Garage (Facility) located on McNicoll Avenue, east of Kennedy Road in the City of Toronto, Ontario.

This letter outlines our responses to the Toronto Public Health (TPH) comments provided in their December 23, 2014 email regarding with the subject "TPH Comment McNicoll Bus Garage EPR (Noise)." A copy of the TPH email can be found as Attachment A. In the email, TPH requests that predicted noise levels for the project be compared against a number of health effect criteria.

1.0 Criteria

In Ontario, applicable sound level limits are outlined in Ministry of the Environment and Climate Change (MOECC) Publication NPC-300. Publication NPC-300 criteria were developed by the MOECC in order to minimize the possibility of annoyance and "adverse effects" (as defined in the *Environmental Protection Act*) from stationary industrial and commercial noise sources, such as the proposed bus garage. A comparison of facility noise impacts versus Publication NPC-300 guidelines has been completed, and can be found in the Novus Report "TTC McNicoll Bus Garage TPAP, Environmental Noise Assessment, Toronto, ON" completed as part of the TPAP process. The Novus report shows that with the inclusion feasible noise mitigation measures, the NPC-300 noise guidelines will be met.

There are a number of other criteria which have been developed internationally, which relate to the health effects of noise. These criteria can be divided into three categories:

1. Disease
2. Annoyance
3. Sleep Disturbance

Modelled noise predictions have been calculated with and without the proposed facility for comparison against these criteria. We understand that the criteria generally represent "no effect levels", and are thus very conservative.

Modelled noise levels have been calculated for each face (N, E, S, and W) of the Mon Shoeng Long Term Care Facility, and the Mon Sheong Court building. **Figure 1** shows the receptor façade locations.

2.0 Disease

Table 1 (attached) presents a comparison of predicted build and no-build sound levels versus published criteria for disease-related health effects, namely ischemic heart disease and hypertension. The criteria are from the Health Council of the Netherlands, and are based on potential public health impacts from large airports.

Noise levels with and without the project are well below the 70 dBA L_{eq} (16h, 6am-10pm) criteria. The maximum increase due to the project will be 1.2 dB. Thus, health impacts from the project in terms of an increase in measureable disease outcomes are highly unlikely.

3.0 Annoyance

Table 1 also provides a comparison with annoyance criteria published by the World Health Organization (WHO) and Health Canada.

The WHO criteria of 50 and 55 dBA for annoyance in outdoor amenity areas are exceeded for both the existing "no-build" condition, and with the project in place (cumulative impacts). However, the increase in noise levels due to the project is only 2.8 dB. In terms of human perception, an increase in noise level of this magnitude would generally be considered to be imperceptible.

Health Canada recommended that the effect of increase noise from a project be assessed in terms of its effect on the percent of people "highly annoyed" with noise in their environment, and recommends that projects should not result in an increase of more than 6.5 % in the number of highly annoyed individuals. The maximum predicted increase resulting from this project is less than 1%.

Therefore, in terms of noise annoyance, the project is unlikely to result in an adverse effect.

4.0 Sleep Disturbance

Table 1 also provides a comparison versus a number of published sleep disturbance thresholds, including criteria for sleep disturbance, increased movement, use of sleep aids, and insomnia. As with the other criteria discussed, the limits are based on sound levels outside of the building, in the plane of an open window. The sleep disturbance criteria can be broken down in to three ranges:

- 40 to 45 dBA L_{eq} Night (11pm to 7 am)

The sleep disturbance criteria in this range are based on "no effect" levels; thus, no measurable effect would be observed for outdoor noises meeting these limits. As can be seen in **Table 1**, both "without project" no-build noise levels and cumulative "with project" noise levels exceed these limits. In fact, 40 to 45 dBA night-time sound levels are not met in the majority of urban environments, and are more typical of noise levels one would receive in rural areas.

The change in sound levels due to the project ranges from 0 to 2.1 dB, which would generally be considered imperceptible.

- 55 dBA L_{eq} Night (11pm to 7 am)

Recognizing the difficulties of meeting the "no effect" guidelines in an urban environment, WHO has adopted 55 dBA as in interim target for sleep disturbance under their Nighttime Noise Guidelines for Europe. As shown in **Table 1**:

a) Approximately 40% of the facades meet the interim target
b) The maximum noise increase is only 1.0 dB, on the northern façade. Resulting sound levels at this location meet the 55 dBA interim target
c) Only 25% of the facades exceed the interim target by more than 3 dB
d) For the 60% of the façade locations where the interim target is exceeded (shown in **bold** in Table 1), the sound levels are driven by existing ambient noise levels, and not from noise due to the bus garage project. For these facades, the maximum increase in noise due to the project is only 0.2 dB.

The proposed project has no effect on -whether the interim target is met.

- 60 dBA L_{eq} Night (11pm to 7 am)

Passchier-Vermier et al. and the Health Council of the Netherlands have recommended that night-time noise levels be less than 60 dBA to avoid sleep pattern disturbance and effects on mood the next day.

The 60 dBA criterion is met at all but two facades, and is only exceeded at two locations by a maximum of 0.7 dB. At these two locations, the excess of the criteria is completely due to non-project related ambient noise levels. The increase in noise levels due to the project is 0 dB.

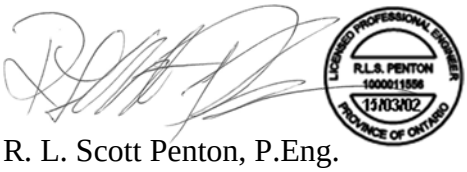
5.0 Summary and Conclusions

Based on the above, noise from the proposed project is unlikely to have a measureable effect on health.

We trust that this information will be helpful. If you have any further questions, please do not hesitate to contact us.

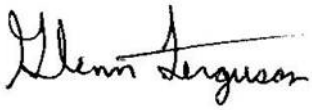
Sincerely,

Novus Environmental Inc.



R. L. Scott Penton, P.Eng.
Principal / Acoustical Specialist

Intrinsik Environmental Sciences Inc.



Glenn Ferguson, Ph.D., QP_{RA}
Vice President – Eastern Region / Senior Scientist

References

Health Canada. 2010. Useful Information for Environmental Assessments.

Health Council of the Netherlands. 1999. Public health impacts of large airports.

Passchier-Vermeer, W., Passchier, W.F. 2000. Noise exposure and public health. Environmental Health Perspectives, 108(1), 123-131.

WHO. 1999b. Guideline for Community Noise. Edited by B. Berglund, T. Lindvall and D.H. Schwela. Geneva.

WHO. 2009. Night noise guidelines for Europe.

Figure No. **1**

Modelled Façade Locations

TTC McNicoll Bus Garage
Toronto, Ontario

True North

Scale: 1: 750
Date: 14 / 01 / 27
File No.: 13-0054
Drawn By: KAC

novus ENVIRONMENTAL

Table 1: TTC McNicoll Bus Garage Noise Assessment - Comparison Versus Health Effects Thresholds

Health Effect	Threshold/ Guideline	Reference	Period	Secenario	Outdoor Living Area	Mon Sheong Long Term Care Building Façade								Mon Sheong Court Building Façade							
						N		E		S		W		N		E		S		W	
						min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
DISEASE																					
Hypertension	70 $L_{Aeq, 16hr}$ (06-22 hr)	Health Council of the Netherlands. 1999. Public health impacts of large airports.	6am-10pm	Without Project	-	56.3	61.4	58.4	66.7	64.5	66.6	54.5	63.0	51.0	63.9	56.8	63.2	64.0	68.0	64.9	68.1
				Cumulative	-	56.7	61.5	57.9	66.7	64.5	66.6	54.6	63.0	52.2	63.9	57.3	63.3	64.0	68.0	64.9	68.1
				Change	-	0.4	0.1	-0.5	0.0	0.0	0.0	0.1	0.0	1.2	0.0	0.5	0.1	0.0	0.0	0.0	0.0
Ischemic health disease	70 $L_{Aeq, 16hr}$ (06-22 hr)	Health Council of the Netherlands. 1999. Public health impacts of large airports.	6am-10pm	Without Project	-	56.3	61.4	58.4	66.7	64.5	66.6	54.5	63.0	51.0	63.9	56.8	63.2	64.0	68.0	64.9	68.1
				Cumulative	-	56.7	61.5	57.9	66.7	64.5	66.6	54.6	63.0	52.2	63.9	57.3	63.3	64.0	68.0	64.9	68.1
				Change	-	0.4	0.1	-0.5	0.0	0.0	0.0	0.1	0.0	1.2	0.0	0.5	0.1	0.0	0.0	0.0	0.0
ANNOYANCE																					
Moderate annoyance, outdoor living area	50 $L_{Aeq, 16hr}$	WHO. 1999b. Guidelines for Community Noise.	7am-11pm	Without Project	**62.4**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Cumulative	**65.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Change	2.8																
Serious annoyance, outdoor living area	55 $L_{Aeq, 16hr}$	WHO. 1999b. Guidelines for Community Noise.	7am-11pm	Without Project	**62.4**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Cumulative	**65.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Change	2.8																
Annoyance, difference between baseline and project	>6.5% difference in %HA	Health Canada. 2010. Useful Information for Environmental Assessments.	24 hrs	Without Project (L_{dn})	-	57.5	62.6	59.6	67.9	65.7	67.8	55.7	64.2	52.2	65.1	58.0	64.4	65.2	69.2	66.1	69.3
				Cumulative (L_{dn})	-	58.2	63.2	59.3	68.0	65.7	67.8	55.9	64.2	53.9	65.2	58.7	64.5	65.2	69.2	66.1	69.3
				Change	-	0.7	0.6	-0.2	0.1	0.0	0.1	0.2	0.0	1.7	0.1	0.8	0.1	0.0	0.0	0.0	0.0
				Without Project %HA	-	5.7	10.5	7.3	19.1	15.0	18.9	4.5	12.7	2.9	14.1	6.0	13.0	14.2	21.9	15.8	22.1
				Cumulative %HA	-	6.2	11.3	7.1	19.3	15.0	19.0	4.6	12.7	3.6	14.2	6.6	13.1	14.2	21.9	15.8	22.1
				Change in %HA	-	0.5	0.8	-0.2	0.2	0.0	0.1	0.1	0.0	0.7	0.1	0.6	0.1	0.0	0.0	0.0	0.0

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Notes:

- All values are in dBA unless otherwise noted
- Values in **Bold** exceed threshold.

Table 1 Continued: TTC McNicoll Bus Garage Noise Assessment - Comparison Versus Health Effects Thresholds

Health Effect	Threshold/ Guideline	Reference	Period	Secenario	Outdoor Living Area	Mon Sheong Long Term Care Building Façade								Mon Sheong Court Building Façade							
						N		E		S		W		N		E		S		W	
						min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
SLEEP DISTURBANCE																					
Subjective sleep quality	40 $L_{Aeq, 8hr}$ (23-07 hr)	Health Council of the Netherlands. 1999. Public health impacts of large airports.	11pm-7am	Without Project	-	**48.9**	**54.0**	**51.0**	**59.3**	**57.1**	**59.2**	**47.1**	**55.6**	**43.6**	**56.5**	**49.4**	**55.8**	**56.6**	**60.6**	**57.5**	**60.7**
				Cumulative	-	**49.9**	**55.0**	**51.0**	**59.5**	**57.1**	**59.3**	**47.3**	**55.6**	**45.7**	**56.6**	**50.4**	**55.9**	**56.6**	**60.6**	**57.5**	**60.7**
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Sleep disturbance, night noise guideline	40 $L_{Aeq, 8hr}$ (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	**48.9**	**54.0**	**51.0**	**59.3**	**57.1**	**59.2**	**47.1**	**55.6**	**43.6**	**56.5**	**49.4**	**55.8**	**56.6**	**60.6**	**57.5**	**60.7**
				Cumulative	-	**49.9**	**55.0**	**51.0**	**59.5**	**57.1**	**59.3**	**47.3**	**55.6**	**45.7**	**56.6**	**50.4**	**55.9**	**56.6**	**60.6**	**57.5**	**60.7**
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Use of sleep-aid drugs and sedatives	40 $L_{Aeq, 8hr}$ (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	**48.9**	**54.0**	**51.0**	**59.3**	**57.1**	**59.2**	**47.1**	**55.6**	**43.6**	**56.5**	**49.4**	**55.8**	**56.6**	**60.6**	**57.5**	**60.7**
				Cumulative	-	**49.9**	**55.0**	**51.0**	**59.5**	**57.1**	**59.3**	**47.3**	**55.6**	**45.7**	**56.6**	**50.4**	**55.9**	**56.6**	**60.6**	**57.5**	**60.7**
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Increased avg. movement during sleep	42 $L_{Aeq, 8hr}$ (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	**48.9**	**54.0**	**51.0**	**59.3**	**57.1**	**59.2**	**47.1**	**55.6**	**43.6**	**56.5**	**49.4**	**55.8**	**56.6**	**60.6**	**57.5**	**60.7**
				Cumulative	-	**49.9**	**55.0**	**51.0**	**59.5**	**57.1**	**59.3**	**47.3**	**55.6**	**45.7**	**56.6**	**50.4**	**55.9**	**56.6**	**60.6**	**57.5**	**60.7**
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Self-reported sleep disturbance	42 $L_{Aeq, 8hr}$ (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	**48.9**	**54.0**	**51.0**	**59.3**	**57.1**	**59.2**	**47.1**	**55.6**	**43.6**	**56.5**	**49.4**	**55.8**	**56.6**	**60.6**	**57.5**	**60.7**
				Cumulative	-	**49.9**	**55.0**	**51.0**	**59.5**	**57.1**	**59.3**	**47.3**	**55.6**	**45.7**	**56.6**	**50.4**	**55.9**	**56.6**	**60.6**	**57.5**	**60.7**
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Environmental insomnia	42 $L_{Aeq, 8hr}$ (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	**48.9**	**54.0**	**51.0**	**59.3**	**57.1**	**59.2**	**47.1**	**55.6**	**43.6**	**56.5**	**49.4**	**55.8**	**56.6**	**60.6**	**57.5**	**60.7**
				Cumulative	-	**49.9**	**55.0**	**51.0**	**59.5**	**57.1**	**59.3**	**47.3**	**55.6**	**45.7**	**56.6**	**50.4**	**55.9**	**56.6**	**60.6**	**57.5**	**60.7**
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Sleep disturbance, outside bedrooms	45 $L_{Aeq, 8hr}$ (23-07 hr)	WHO. 1999b. Guidelines for Community Noise.	11pm-7am	Without Project	-	**48.9**	**54.0**	**51.0**	**59.3**	**57.1**	**59.2**	**47.1**	**55.6**	43.6	**56.5**	**49.4**	**55.8**	**56.6**	**60.6**	**57.5**	**60.7**
				Cumulative	-	**49.9**	**55.0**	**51.0**	**59.5**	**57.1**	**59.3**	**47.3**	**55.6**	**45.7**	**56.6**	**50.4**	**55.9**	**56.6**	**60.6**	**57.5**	**60.7**
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Sleep disturbance, interim target	55 $L_{Aeq, 8hr}$ (23-07 hr)	WHO. 2009. Night noise guidelines for Europe.	11pm-7am	Without Project	-	48.9	54.0	51.0	**59.3**	**57.1**	**59.2**	47.1	**55.6**	43.6	**56.5**	49.4	**55.8**	**56.6**	**60.6**	**57.5**	**60.7**
				Cumulative	-	49.9	55.0	51.0	**59.5**	**57.1**	**59.3**	47.3	**55.6**	45.7	**56.6**	50.4	**55.9**	**56.6**	**60.6**	**57.5**	**60.7**
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Sleep pattern	< 60 $L_{Aeq, 8hr}$ (23-07 hr)	Passchier-Vermeer et al., 2000. "Noise exposure and public health". Env. Health Persp., 108(1), 123-131.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	**60.6**	57.5	**60.7**
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	**60.6**	57.5	**60.7**
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0
Mood next day	< 60 $L_{Aeq, 8hr}$ (23-07 hr)	Health Council of the Netherlands. 1999. Public health impacts of large airports.	11pm-7am	Without Project	-	48.9	54.0	51.0	59.3	57.1	59.2	47.1	55.6	43.6	56.5	49.4	55.8	56.6	**60.6**	57.5	**60.7**
				Cumulative	-	49.9	55.0	51.0	59.5	57.1	59.3	47.3	55.6	45.7	56.6	50.4	55.9	56.6	**60.6**	57.5	**60.7**
				Change	-	1.0	1.0	0.0	0.2	0.0	0.1	0.2	0.0	2.1	0.1	1.0	0.1	0.0	0.0	0.0	0.0

Notes:

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