Hamilton

HAMILTON CITY HALL

BASEMENT MECHANICAL EXHAUST AIR FEASIBILITY STUDY

Project No.: 2022-0232-10

July 19, 2022

WALTERFEDY

HAMILTON CITY HALL

BASEMENT MECHANICAL EXAHUST AIR
Feasibility Study

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EXECUTIVE SUMMARY

The City of Hamilton has engaged WalterFedy to investigate the feasibility of relocating the location of the exhaust air from the basement mechanical room. The current location at the ground floor level at the south entrance has created challenges during the past two winter seasons.

This study considered three options to re-direct and relocate the exhaust air discharge location as follows:

Option #1: Extend ducts from the top of current duct shafts up through Level 2 with exposed stainless steel ductwork. Costs include premium time for construction.
Opinion of Costs: $140,760

Option #2: Install new exhaust air louvres at the south side of the existing duct shafts. Air will be discharged beneath the bridge to the Hunter St. parking lot. Costs include premium time for construction
Opinion of Costs: $80,040

Option #3: Extend new exhaust ducts from shaft to the south at underside of bridge. Provide louvres to discharge air to the east and west directions at high-level. New ductwork to be encased in metal cladding to match underside of bridge. Costs include premium time for construction
Opinion of Costs: $216,660

As part of our review of the exhaust air systems from the Basement we reviewed options for energy recovery. A heat recovery run-around loop was evaluated to transfer heat from the exhaust air stream to pre-heat the outdoor air for the air handling units in the Basement Mechanical Room. The pay back for this installed was determined to be 6.8 years. Our report also reviews the impact of implementing an occupancy schedule for HVAC systems as all air handing units and exhaust fans are operating 24/7 according to the data provided. The implementation of occupancy schedules through the BAS has a significant energy reduction for very little cost and a payback of under 1 year.

1.0 INTRODUCTION

WalterFedy has been retained by the City of Hamilton to review alternate locations for the exhaust air discharge from the basement mechanical room.

The existing location at the south doors at ground floor level has created challenges during the past two winter seasons, by discharging warm exhaust air beneath the overhang.

Our team reviewed the mechanical drawings prepared by Group Eight Engineering Ltd., dated January 2009, and completed a site review of the existing installation with city staff.

2.0 EXISTING CONDITIONS

The two existing air louvres are approximately 10′x10′ in size and are original to the building construction in 1960. During the renovation of the building in 2009 and 2010, these louvres were maintained and re-used and designated as a heritage feature of the building.

Located behind each louvre is a large duct of approximately 25 SF that rises up from the Basement Mechanical Room.

The air exhausted from these louvers is a combination of air from exhaust fans EF 1, 2, 5 and return air fans RF 2, 4.

The total volume of air to be exhausted from each louvre at peak capacity is:

- East Side: 38,100 CFM
- West Side: 32,600 CFM

All options to re-route the exhaust air will also include blanking off the existing louvres from behind and leaving the existing louvres in place to maintain the current appearance.

3.0 REVIEW

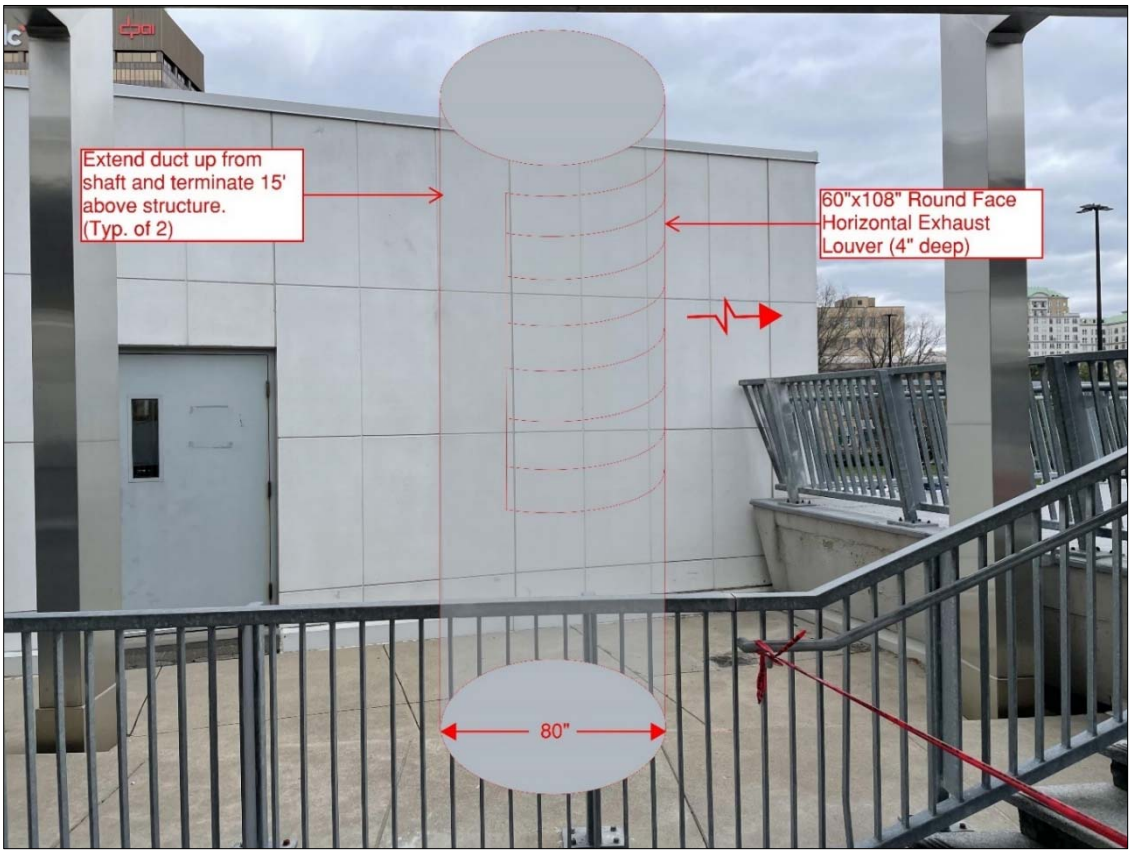
3.1 Option #1

Part of our review to determine an alternate route for the exhaust duct combining the exhaust systems into one shaft at either the east or west side. This would require running large ducts through the centre area of the basement mechanical room.

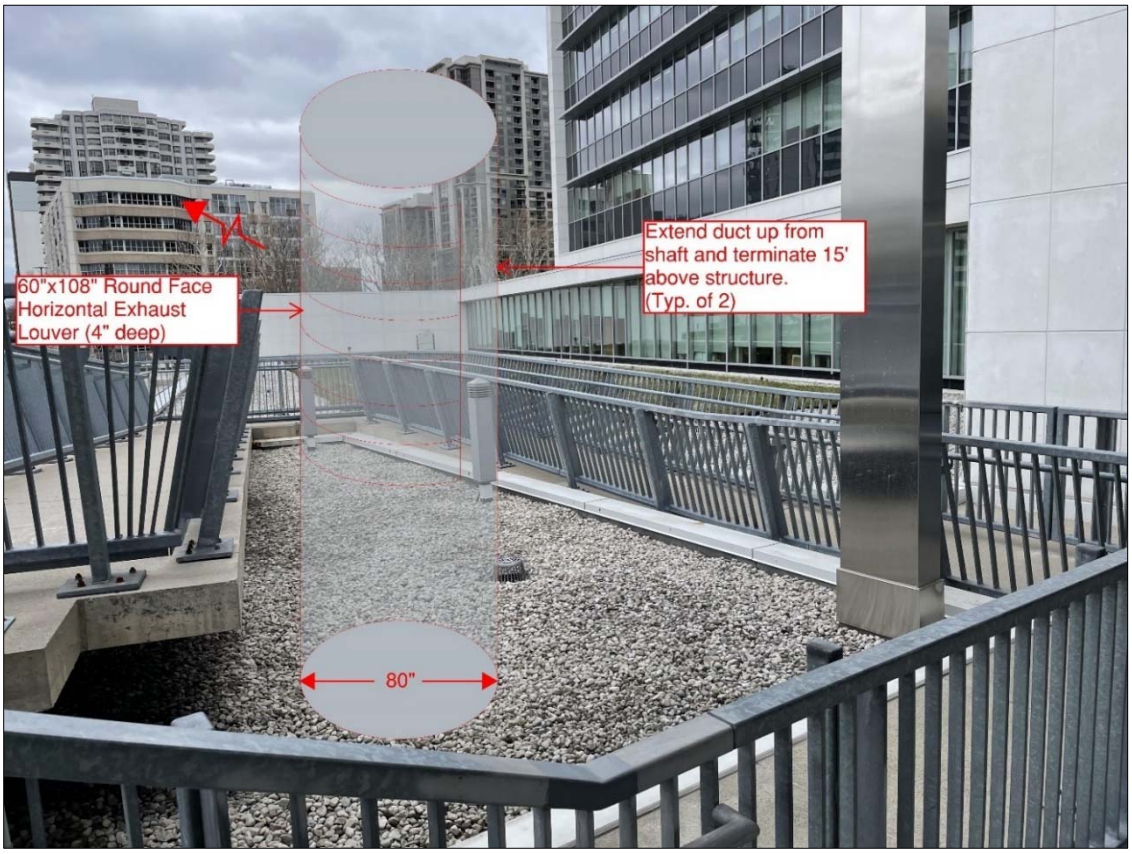
Unfortunately, this approach is not possible due to the existing piping and pumps installed in this area. All of the pipes and equipment would need to be relocated and re-worked in order to create sufficient space for additional duct work within the basement mechanical room. This would add significant cost and impact to building operations.

Option #1 is based on extending a free-standing duct up through the top of the existing shaft by using a round stainless-steel duct. The duct would be heavy gauge steel with circular louvre to discharge air (Refer to Figure B). Cutting and patching of the “roof” would be required as part of the work.

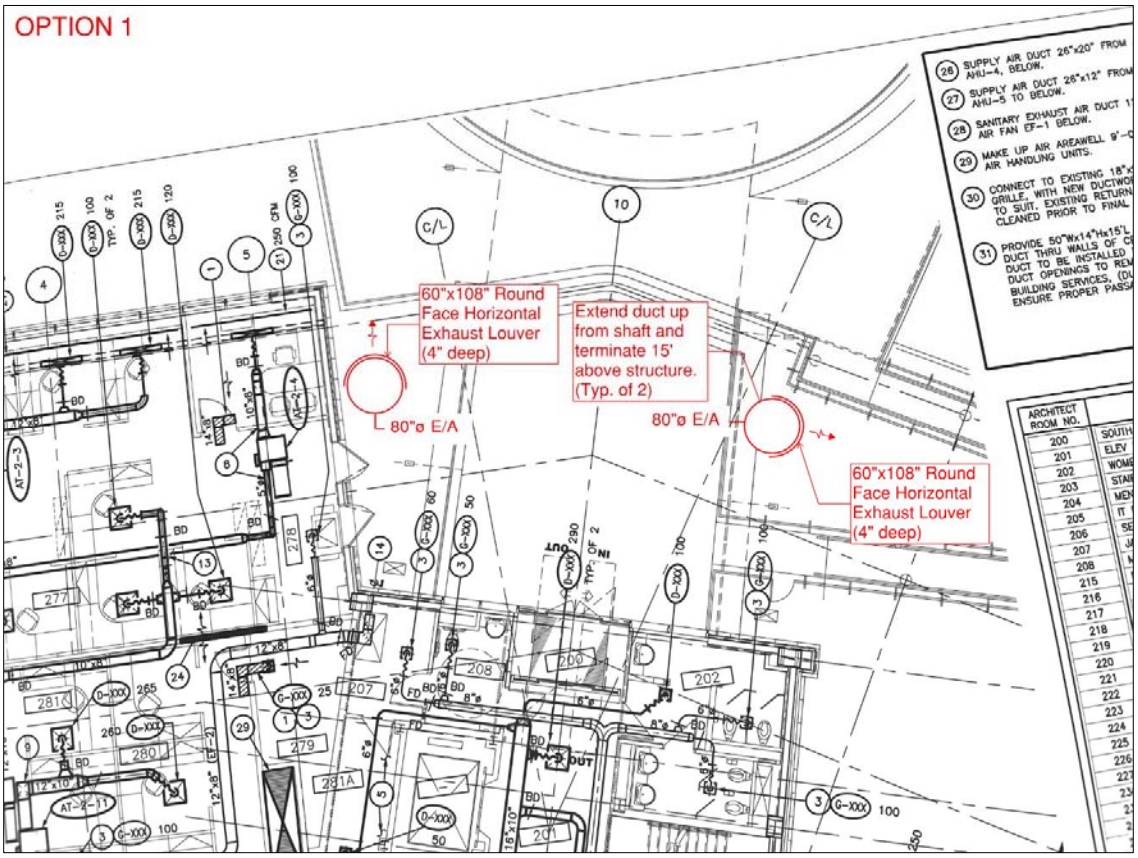
Utilizing exposed ductwork as a free-standing monument feature has been used in other municipal buildings such as the Pompidou Centre in Paris, France (Refer to Figure A) and the Bank of Canada Atrium.



Option 1 - East Elevation



Option 1 – West Elevation



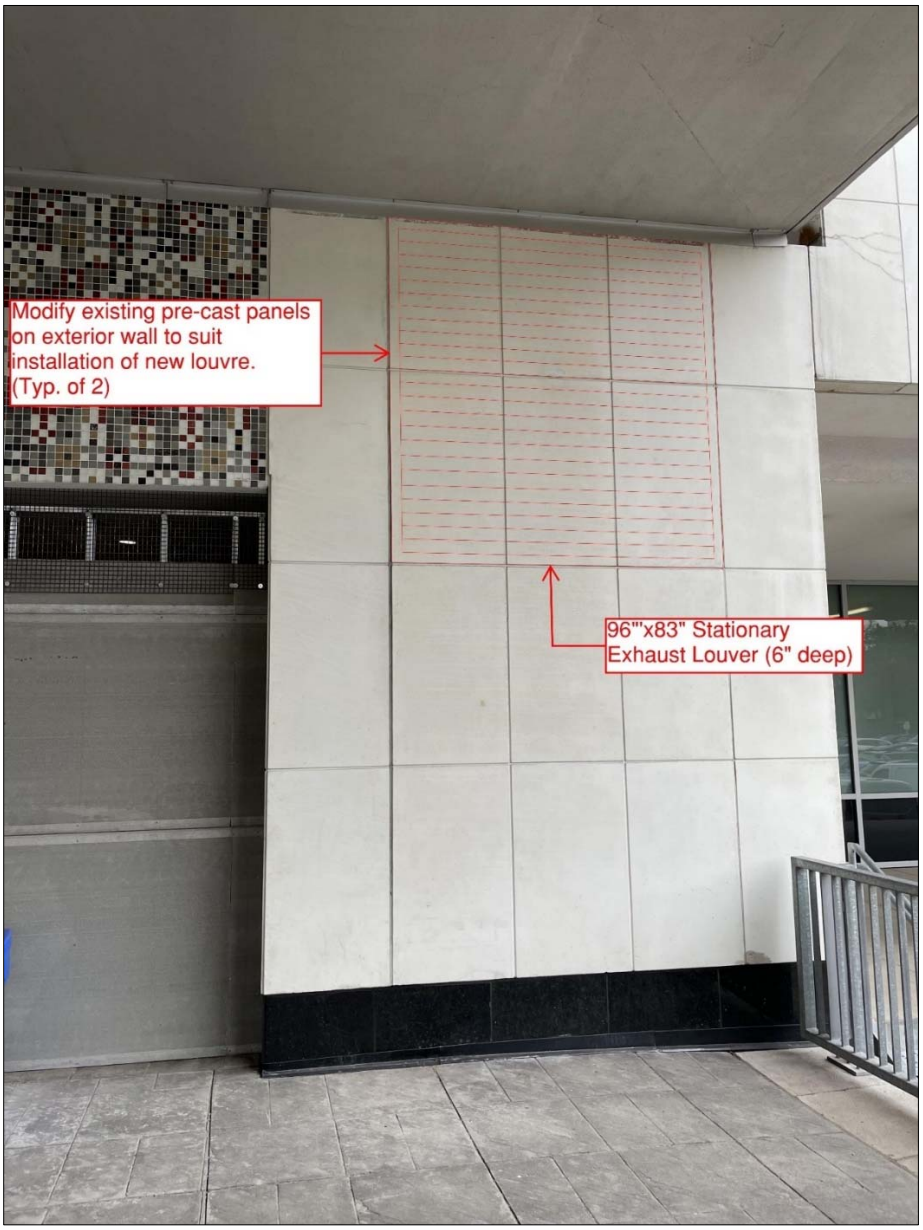
Option 1 – Plan View

3.2 Option #2

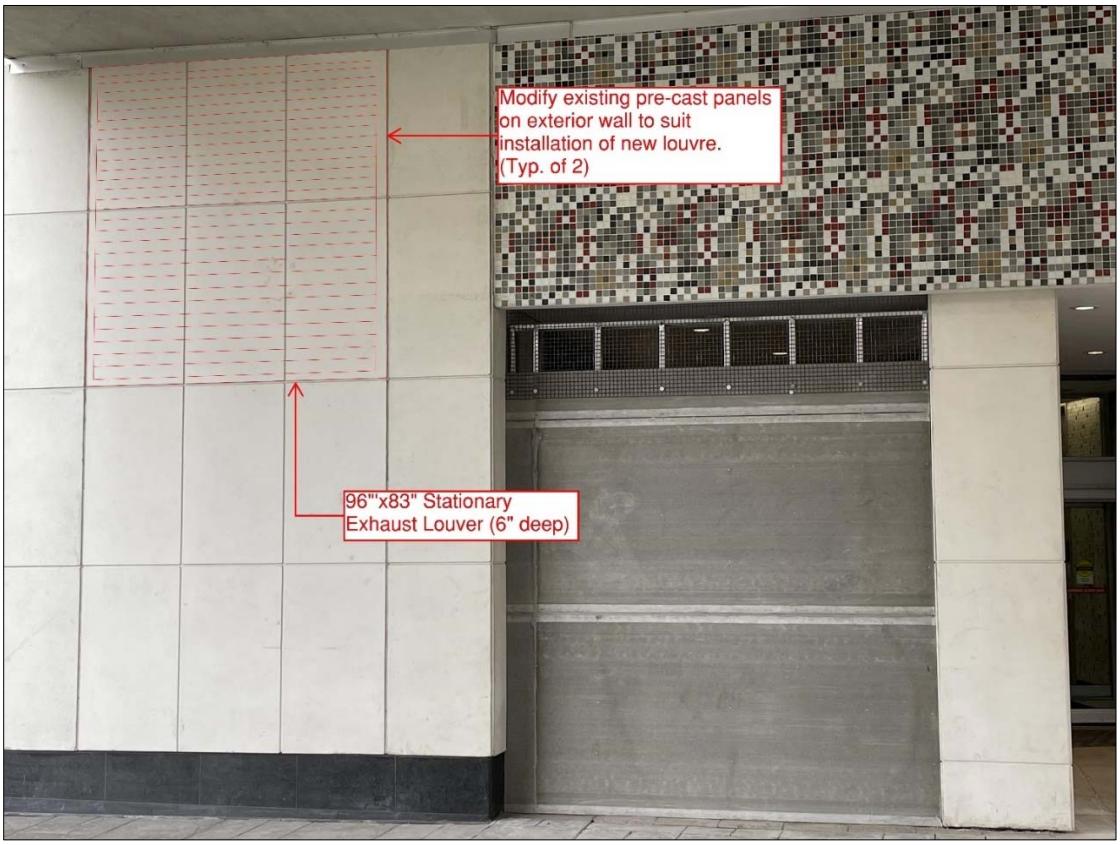
Option #2 includes providing new exhaust air louvres in the south face of the existing shafts. The existing louvres would remain but be blanked off and the new louvres would be specified to match the appearance of the existing as closely as possible.

To install these new louvres, the pre-cast panel on the south face would be removed and cut as necessary. This location, the exhaust air will be discharged beneath the covered area, and create an area of slightly warmer air, but the warmer air will be dissipated due to winds and not create a concentrated area of warm air as the current installation does.

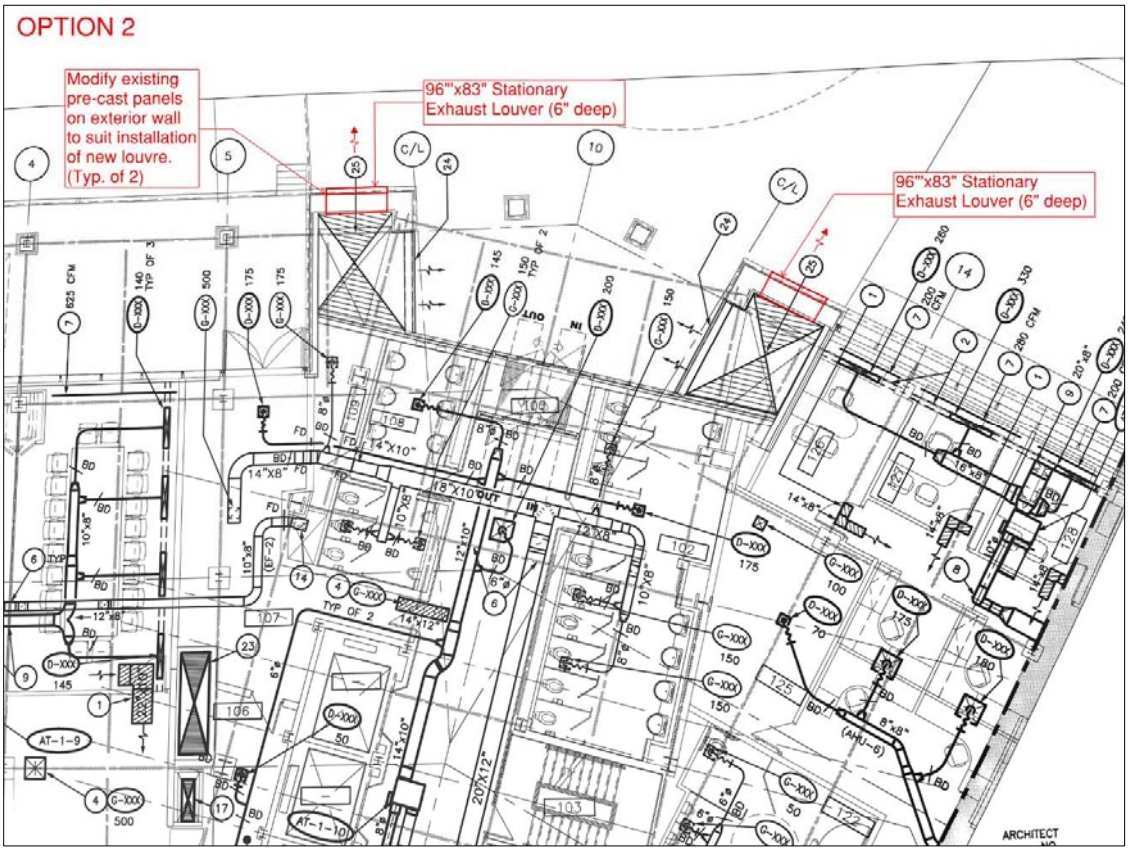
Additional options to create a new duct shaft from the basement mechanical room to run up to L2 roof were reviewed on site. An option to create this new shaft was dismissed as this would require building new duct shafts through the office and administration areas on Level 1 and 2. This would necessitate either a relocation of some staff or a reduction in usable office area.



Option 2 - East Elevation



Option 2 - West Elevation



Option 2 - Plan View

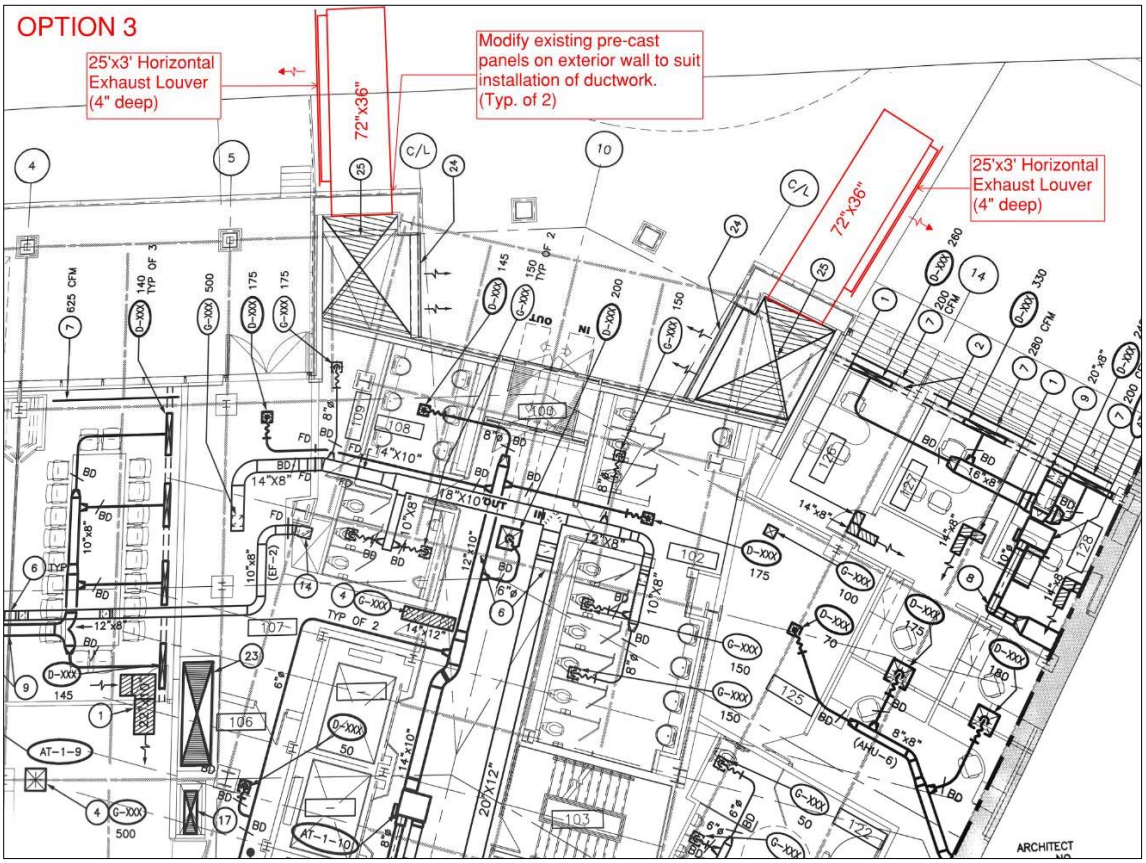
3.3 Option #3

Option #3 is to extend the exhaust air discharge location further away from the existing location and aim the discharge in the east and west directions at high-level.

This can be accomplished by installing a 72" x 36" duct out from each shaft (southward). The pre-cast panels on south face would be removed and cut to install new duct tight to the underside of bridge above. A low profile louvre of 25" x 3" would be installed to discharge the air toward the parking lot on each side. The duct would be encased with metal cladding, so the appearance blends in with the underside of structure above.

Option 3 - East Elevation

Option 3 - West Elevation



Option 3 - Plan View

4.0 COST SUMMARY

4.1 Opinion of Probable Construction Costs

Refer to chart below for our opinion of probable construction costs for the three options identified in this report.

The opinion of costs below is based on the following:

- Work during normal hours but with premium time allowance for 50% of the labour to account for after-hours installation requirements.
- Costs are based on current information available for materials and labour.

Opinion of Probable Costs **Mechanical**

Hamilton City Hall - EA Duct Report **2022-0232-10**

Item	Option 1 - Vertical Duct Towers	Budget Cost
1	Materials (Ductwork, Dampers, Insulation)	$ 30,000.00
2	Two (2) EVH-501D Vertical Louvres	$ 27,000.00
3	Labour (inc premuim time)+ TAB	$ 30,000.00
4	Miscellaneous (Patching,Coring, etc)	$ 15,000.00
5	20% Contingency	$ 20,400.00
6	Soft Costs (permit & design) 15%	$ 18,360.00
7	Total	$ 140,760.00

Item	Option 2 - Stationary Wall Louvres	Budget Cost
1	Materials (Ductwork, Dampers, Insulation)	$ 18,000.00
2	Two (2) ESD-635 Horizontal Stationary Louvres	$ 10,000.00
3	Labour (inc premuim time)+ TAB	$ 20,000.00
4	Miscellaneous (Patching,Coring, etc)	$ 10,000.00
5	20% Contingency	$ 11,600.00
6	Soft Costs (permit & design) 15%	$ 10,440.00
7	Total	$ 80,040.00

Item	Option 3 - Horizontal Duct Extension	Budget Cost
1	Materials (Ductwork, Dampers, Insulation)	$ 78,000.00
2	Two (2) EVH-501D Vertical Louvres	$ 14,000.00
3	Labour (inc premium time + TAB+Cladding	$ 55,000.00
4	Miscellaneous (Patching,Coring, etc)	$ 10,000.00
5	20% Contingency	$ 31,400.00
6	Soft Costs (permit & design) 15%	$ 28,260.00
7	Total	$ 216,660.00

Figure A – Pompidou Centre, Paris France

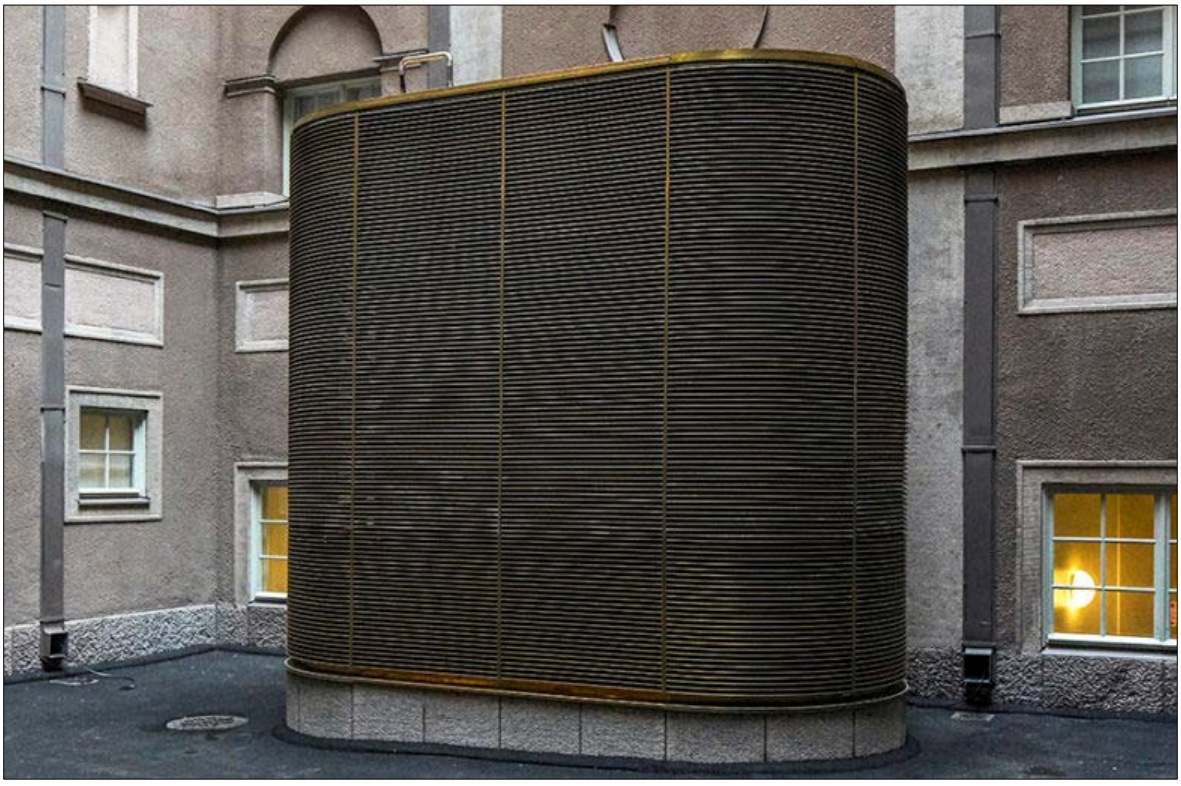


Figure B – Example of Curved Exhaust Louvre

5.0 ENERGY REPORT

5.1 Background

City of Hamilton engaged WalterFedy to complete a heat recovery analysis for Hamilton City Hall to be potentially included in the exhaust air ducting renovation. The intent is to investigate a coil energy recovery (runaround) loop given the limited space available and provide estimated energy savings.

5.2 Scope of Work

The scope of work is detailed in the ASR-01-Review of existing exhaust air at rear door associated with WalterFedy proposal number 2022-0232-10. A brief summary is as follows:

- Perform an energy analysis of implementing a heat recovery option with exhaust air.
- Provide client with energy and cost saving results in a simplified report format.

5.3 Contact Information

Contact information for WalterFedy (the Consultant) and City of Hamilton (the Client) is provided in Table 1.

Table 1: Contact Information

Description	Consultant	Client
Organization	WalterFedy	City of Hamilton
Address	Suite 1000, 20 Hughson Street South	28 James Street North, 5th Floor
Location	Hamilton, ON	Hamilton, ON
Postal code	L8N 2A1	L8R 2K1
Contact name	Patrick Darby	Julia Furii
Credentials	P.Eng., CEM, CMVP, LEED AP	FMP
Title	Senior Energy Engineer	Project Coordinator of Strategic Planning & Compliance
Phone	226 220 8968	905.546.2424 Ext. 1512
Email	pdarby@walterfedy.com	Julia.Furii@hamilton.ca

5.4 Facility Description Methodology

The facility description was developed based on the existing conditions established according to the following methodology.

1. **Facility Document Review**. Available facility documents were reviewed, including the following.
   - Building drawings.
   - Historical utility use data.

2. **Facility Description.** Information obtained from the above activities is summarized throughout Section 2.

5.5 Facility Overview

An overview of Hamilton City Hall is provided in Table 2.

Table 2: Facility Overview

Description	Unit	Value
Name	[-]	City Hall
Address	[-]	71 Main St W
Location	[-]	Hamilton, ON
Type	[-]	Office
Construction year	[-]	1960 and 2009
Gross floor area	[ft2]	100,000
Site survey date(s)	[yyyy-mm-dd]	2022-04-27

5.6 Occupancy Schedule

The Hamilton City Hall occupancy schedule is from 08:00-17:00, Monday to Friday. The Hamilton City Hall is closed on Saturdays and Sundays.

5.7 Air Distribution

Tables 3 and 4 list details for significant air distribution systems.

Table 3: Air Distribution Systems – General

Tag	Serves	Flow	Static	Power	Manual ON	Months	Mon	Tue	Wed	Thu	Fri	Sat	Sun	ON if	OFF if
-	-	[cfm]	[in,H2O]	[hp]	[1/0]	[mth]	[hr]	[hr]	[hr]	[hr]	[hr]	[hr]	[hr]	-	-
AHU3	Council chambers	9,800	1.75	15	0	1-12	0-23	0-23	0-23	0-23	0-23	0-23	0-23	0	0
AHU4	Lobbies	6,800	1.5	15	0	1-12	0-23	0-23	0-23	0-23	0-23	0-23	0-23	0	0
AHU7	Basement	9,100	2	15	0	1-12	0-23	0-23	0-23	0-23	0-23	0-23	0-23	0	0
EF1	Sanitary exhaust	4,500	2.6	5	0	1-12	0-23	0-23	0-23	0-23	0-23	0-23	0-23	0	0
EF5	Mechanical Room Exhaust	3,300	1.25	1.5	0	1-12	0-23	0-23	0-23	0-23	0-23	0-23	0-23	0	0
RF2	AHU-4 & AHU-5 Return Air	21,000	2.25	15	0	1-12	0-23	0-23	0-23	0-23	0-23	0-23	0-23	0	0
RF3	AHU-3 Return Air	9,300	1.9	5	0	1-12	0-23	0-23	0-23	0-23	0-23	0-23	0-23	0	0

Table 4: Air Distribution Systems – Loads

Tag	Serves	Min OA	Max OA	ERV effect.	Diversity	Load	Min SATSP	Winter STSP	Summer STSP	Winter RHSP	Summer RHSP
-	-	[dcml]	[dcml]	[dcml]	[dcml]	[dcml]	[C]	[C]	[C]	[dcml]	[dcml]
AHU3	Council chambers	0.194	1	0	1	0.8	18	22	22	0.3	0.7
AHU4	Lobbies	0.221	1	0	1	0.8	18	22	22	0.3	0.7
AHU7	Basement	0.288	1	0	1	0.8	18	22	22	0.3	0.7
EF1	Sanitary exhaust	0	0	0	1	0.8	0	0	0	0	0
EF5	Mechanical Room Exhaust	0	0	0	1	0.8	0	0	0	0	0
RF2	AHU-4 & AHU-5 Return Air	0	0	0	1	0.8	0	0	0	0	0
RF3	AHU-3 Return Air	0	0	0	1	0.8	0	0	0	0	0

5.8 Utility Baseline Analysis Methodology

The utility use baseline is developed from a bottom-up hourly analysis (spanning one year) of the following energy end uses, as applicable. The analysis uses hourly historical weather data measurements from the source indicated in Section 3.2. The analysis reflects the existing conditions of the facility as documented in Section 2.

1. **Fans**. Calculated for each fan identified in Section 2.4 based on the power, diversity, load, and ON/OFF conditions indicated for each fan.

2. **Heating (OA)**. Calculated for each applicable fan identified in Section 2.4 based on outside air (OA) flow rates (which correspond to fan operations) and the assumed minimum supply air temperature setpoint assumed for each fan. Analysis accounts for sensible heating only.

5.9 Utility Baseline Analysis Assumptions

Assumptions applied throughout the methodology are summarized as follows:

- Historical, hourly weather data is taken from a weather station in Hamilton for the year 2019.
- GHG emissions factor and utility cost rate assumptions are as per Table 5.

Table 5: GHG Emissions Factor and Utility Cost Rate Assumptions

Category	Utility	Description	Unit	Value
GHG emissions factors	Electricity Natural gas	GHG emissions factor GHG emissions factor	[mtCO2e/kWh] [mtCO2e/m3]	0.000041 0.001899
Utility cost rates	Electricity Natural gas	Consumption (blended) Consumption (blended)	[$/kWh] [$/m3]	0.15 0.33

5.10 Utility Use Baseline

5.10.1 Hourly

Hourly electricity use estimates associated with relevant electricity end uses are plotted in Figure 1.

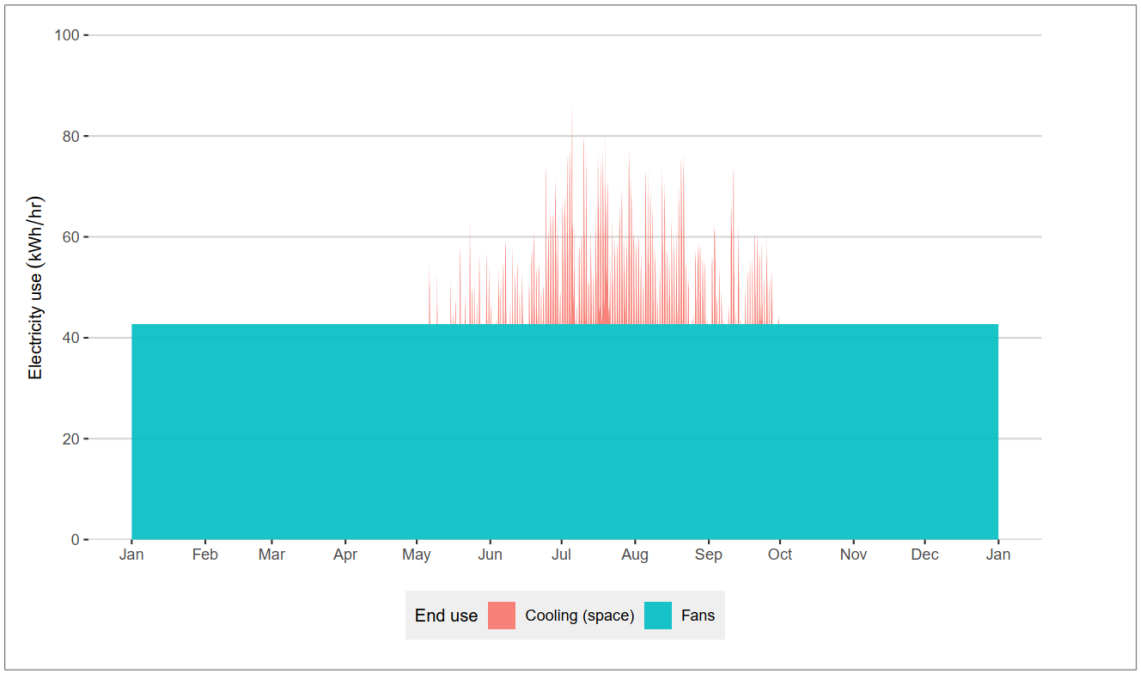


Figure 1: Modelled hourly electricity use baseline estimate

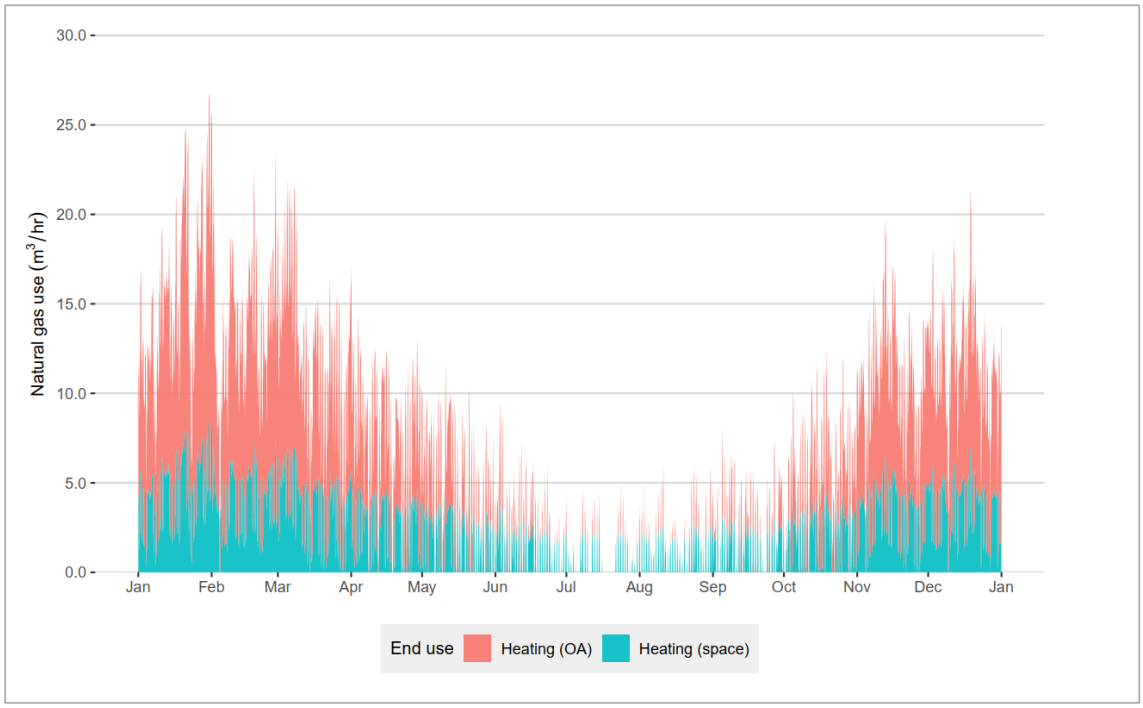


Figure 2: Modelled hourly natrual gas use baseling estimate

5.10.2 Monthly

The relevant end uses for monthly electricity use and demand are plotted in Figures 3 and 4, respectively.

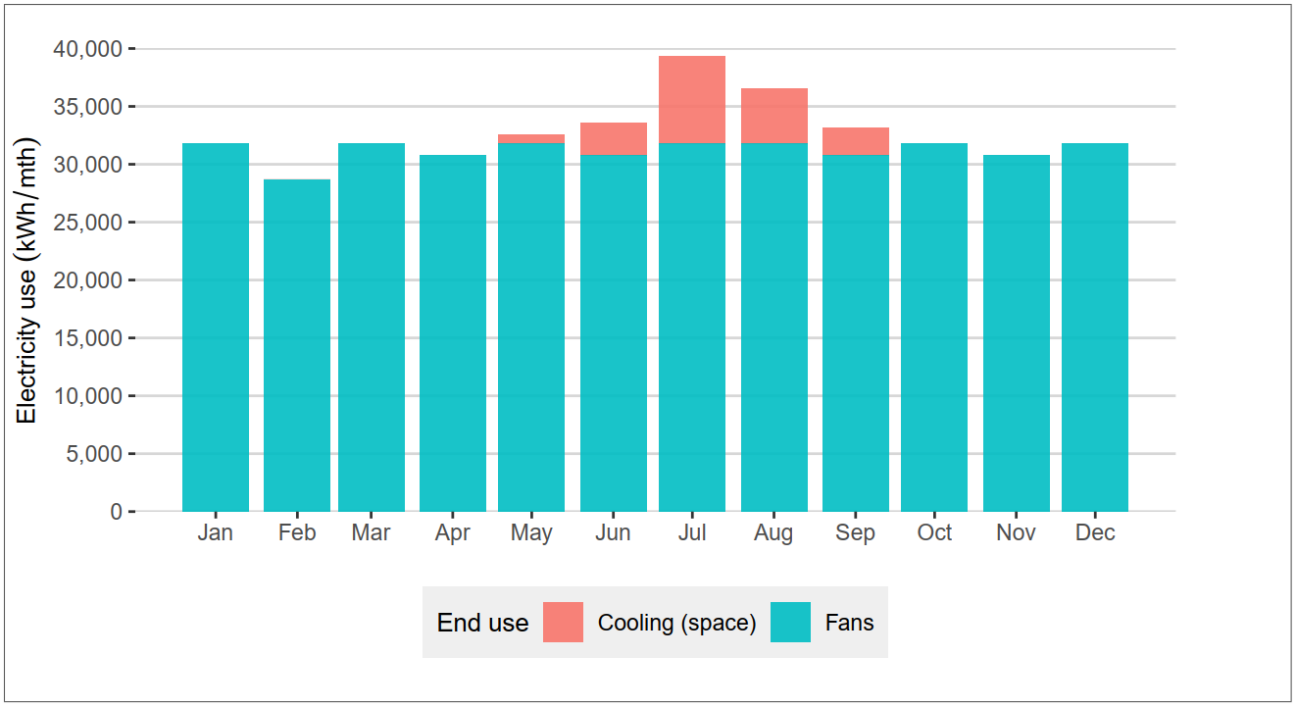


Figure 3: Modelled monthly electricity use baseline estimate

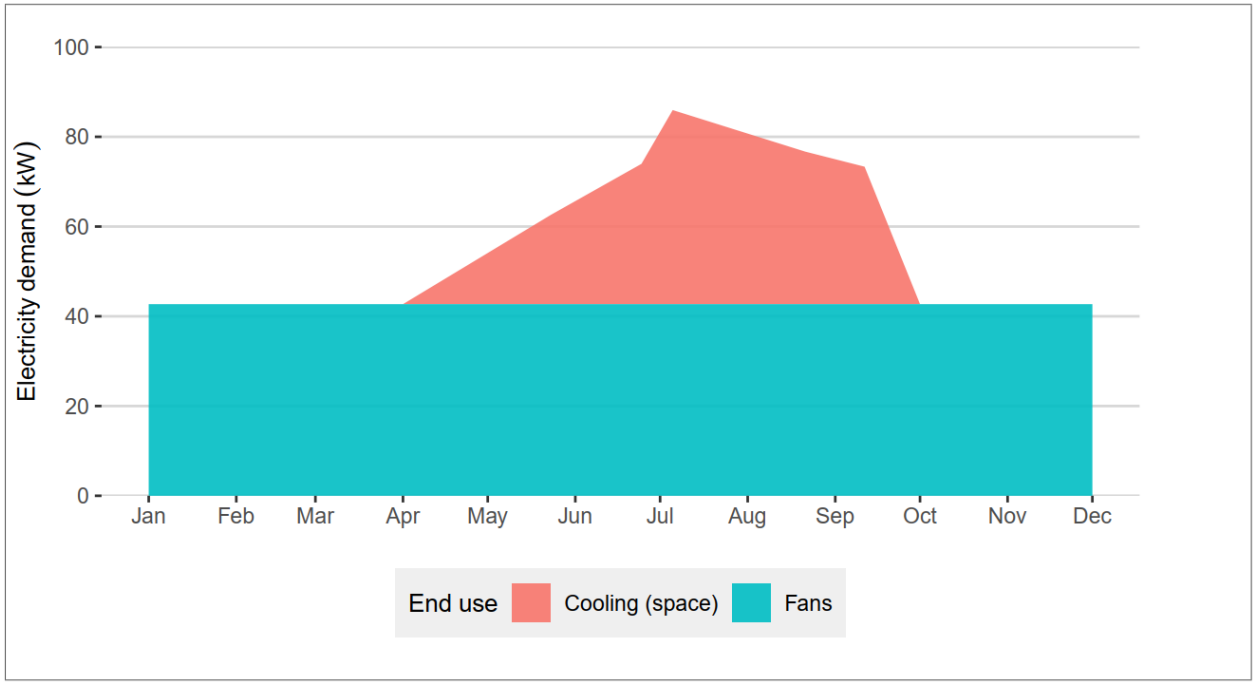


Figure 4: Modelled monthly electricity peak baseline estimate

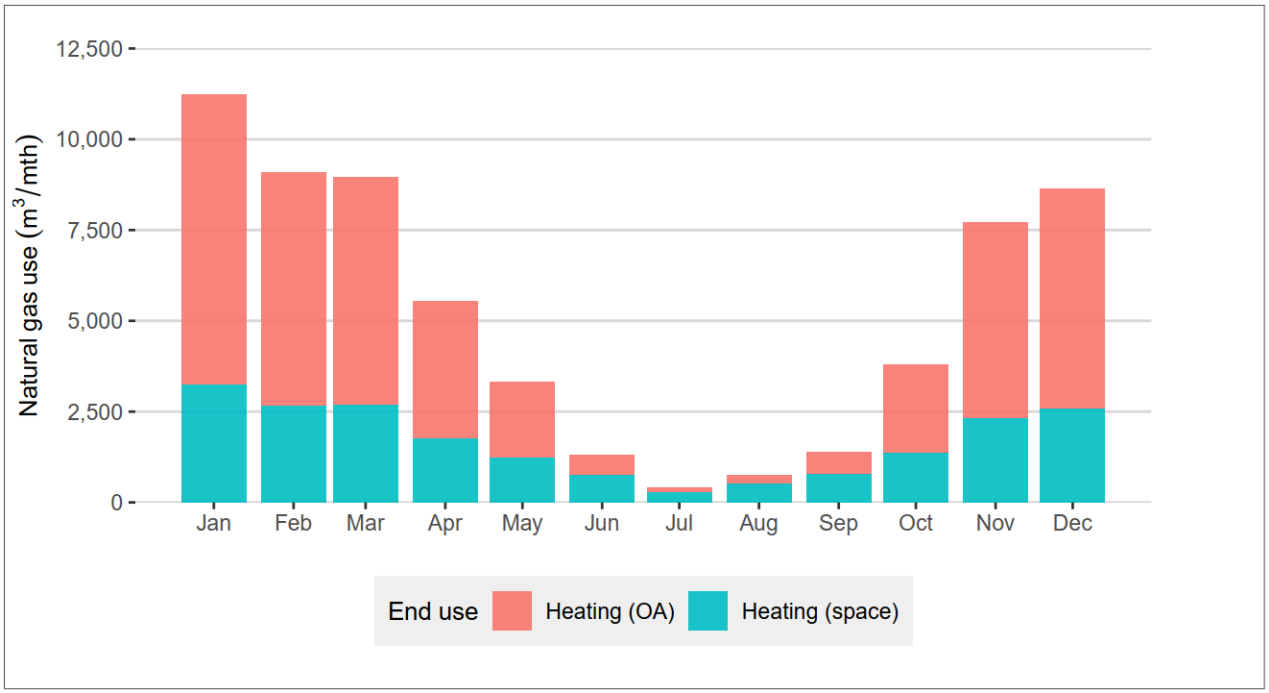


Figure 5: Modelled monthly natural gas use baseline estimate

5.10.3 Yearly

Yearly utility use of relevant end uses using the hourly electricity, and natural gas use baseline estimates is summarized in Table 6.

Table 6: Yearly Utility Use Baseline Of Relevant End Uses

Category	Description	Unit	Baseline
Utility use	Electricity use from grid	[kWh/yr]	392,567
	Electricity peak (avg)	[kW]	56
	Natural gas use	[m3/yr]	62,101
GHG emissions	Electricity GHG emissions	[tCO2e/yr]	16
	Natural gas GHG emissions	[tCO2e/yr]	118
	Total GHG emissions	[tCO2e/yr]	134
Utility cost	Electricity utility cost	[$/yr]	58,885
	Natural gas utility cost	[$/yr]	20,493
	Federal carbon charge	[$/yr]	4,717
	Total utility cost	[$/yr]	84,096

5.11 Measures Analysis Methodology

The general methodology applied for the measure analysis is as follows.

1. **Measure identification**. A run-around loop for heat recovery has been identified as an energy saving opportunity as part of an exhaust duct relocating project at the Hamilton City Hall. A run-around loop has been analyzed due to space constraints that prohibits the use of an energy recovery wheel or an energy/heat recovery ventilator.

2. **Energy analysis.** Energy analysis is completed for this measure, as follows.

    - Electricity and natural gas use reduction are estimated according to the same methodology as in the utility use baseline analysis (see Section 3.1), except with modified assumptions specific to the measure. The modified assumptions are summarized in the report section dedicated to that measure. The energy use reduction is calculated as the difference between baseline and proposed scenario energy use.
    - GHG emissions reduction is estimated based on the electricity and natural gas use reduction estimates and GHG emissions factor assumptions indicated in Table 5.
    - Utility cost reduction (for electricity and natural gas) is calculated based on the electricity and natural gas use reduction estimates and cost rates summarized in Table 5.

3. **Results summary**. Results of the measure analysis are summarized throughout Section 4.

5.12 Measure Analysis Assumption

Assumptions general to all measures are as follows:

- GHG emissions factor and utility cost rate assumptions are as per Table 5, in Section 3.2.

5.13 Measures Considered but Not Analyzed

Below are other energy recovery options for the exhaust air systems at Hamilton City Hall that were considered but not analyzed. Descriptions of the measures and the reasons they were not analyzed are provided below.

- **Energy recovery wheel**. An energy recovery wheel transfers both sensible and latent heat from the exhaust air to the supply air via a physical wheel rotating through both air streams. This requires the exhaust and return air streams be located side by side. The configuration of the existing ductwork and the physical space requirement for the energy recovery wheel would require an expensive redesign of the HVAC system leading to an unreasonably long payback period so this measure is not analyzed further.
- **Energy recovery core**. An energy recovery core transfers both sensible and latent heat from the exhaust air to the supply air via heat exchange core with an air stream passing through it on either side. This requires the exhaust and return air streams be located side by side. The configuration of the existing ductwork and the physical space requirement for the energy recovery core would require an expensive redesign of the HVAC system leading to an unreasonably long payback period so this measure is not analyzed further.

5.14 Occupancy Schedule Optimization

5.14.1 Measure Description

(1) Existing Condition

EF1, EF2, RF2, RF3, AHU3, AHU4, and AHU7 all operate 24/7.

(2) Recommended Action

It may be possible to reduce energy use by using occupancy schedules on the AHUs.

(3) Utility-savings mechanism

Reduced fan energy use through reduced run-time. Reduced heating and cooling energy use associated with reduced OA flow when the unit is OFF.

5.14.2 Measure Details

Project costs are based on previous project experience.

Table 7: Project Cost Estimate

Line item	Unit	Value
Controls Trade Labour	[$]	5,000
Total	[$]	5,000

5.14.3 Utility Analysis

Baseline: Existing conditions modelled as described in Tables 3 and 4. All units operate 24/7. Proposed: EF1, EF2, RF2, and RF3 and AHU3, AHU4, and AHU7 are modelled to operate from 06:00-19:00, Monday to Friday when the building is occupied and are turned OFF at night and on Saturday and Sunday. Note that this operating schedule is only assumed for the purpose of demonstrating potential energy savings and has not been confirmed with the building owner.

Analysis results are summarized in the following table.

Table 8: Analysis Results Summary

Category	Description	Unit	Baseline	Proposed	Reduction	Reduction (%)
Utility use	Electricity use from grid	[kWh/yr]	392,567	162,518	230,049	58.6
	Electricity peak (avg)	[kW]	56	56	0	0.0
	Natural gas use	[m3/yr]	62,101	26,860	35,241	56.7
GHG emissions	Electricity GHG emissions	[tCO2e/yr]	16	7	9	58.4
	Natural gas GHG emissions	[tCO2e/yr]	118	51	67	56.8
	Total GHG emissions	[tCO2e/yr]	134	58	76	56.7
Utility cost	Electricity utility cost	[$/yr]	58,885	24,378	34,507	58.6
	Natural gas utility cost	[$/yr]	20,493	8,864	11,629	56.7
	Federal carbon charge	[$/yr]	4,717	2,040	2,677	56.8
	Total utility cost	[$/yr]	84,096	35,282	48,814	58.0
Financial	Total project cost	[$]	0	5,000	-5,000	-
	Simple payback period	[yr]	-	0.1	-	-

5.15 Run Around Loop

5.15.1 Measure Description

(1) Existing Condition

There is no heat recovery between the exhaust air in EF1, EF2, RF2, and RF3 and the supply air in AHU3, AHU4, and AHU7. Further details about these units can be found in Tables 3 and 4.

(2) Recommendation Action

Install a run around loop to recover heat from the exhaust air stream to the supply air stream. This will reduce the amount of energy needed to condition outside air because of the heat recovery from the exhaust air stream in the winter.

(3) Utility Savings Mechanism

Reduced natural gas consumption due to reduced hot water use in the heating coils for the AHUs in the winter. A small decrease in electricity consumption is expected in the summer due to the exhaust air being close in temperature to the outside air. However, electricity consumption will increase from the additional pump required for the run around loop and for the fans to overcome the additional pressure drop from the added coils. Overall, changes in electricity consumption are expected to be approximately negligible.

5.15.2 Measure Details

Refer to the table below for our opinion of probable construction costs for the installation of four (4) heat recovery coils, four (4) pre-heat coils, along with two (2) circulating pumps, piping, glycol tank and controls for the run around loop. Costs assume all work is done during normal work hours and are based on current information available for materials and labour.

Table 9: Project Cost Estimate

Line item	Unit	Value
Materials and Labour	[$]	60,000
Total	[$]	60,000

5.15.3 Utility Analysis

Baseline: Existing conditions modelled as described in Tables 3 and 4. Proposed: EF1, EF2, RF2, and RF3 and AHU3, AHU4, and AHU7 are modelled with an energy recovery effectivenss of 40%. All other variables remain unchanged from the baseline.

Analysis results are summarized in the following table.

Table 10: Analysis Results Summary

Category	Description	Unit	Baseline	Proposed	Reduction	Reduction (%)
Utility use	Electricity use from grid	[kWh/yr]	392,567	392,195	372	0.09
	Electricity peak (avg)	[kW]	56	54	2	3.57
	Natural gas use	[m3/yr]	62,101	40,544	21,557	34.71
GHG emissions	Electricity GHG emissions	[tCO2e/yr]	16	16	0	0.00
	Natural gas GHG emissions	[tCO2e/yr]	118	77	41	34.75
	Total GHG emissions	[tCO2e/yr]	134	93	41	30.60
Utility cost	Electricity utility cost	[$/yr]	58,885	58,829	56	0.10
	Natural gas utility cost	[$/yr]	20,493	13,380	7,113	34.71
	Federal carbon charge	[$/yr]	4,717	3,080	1,637	34.70
	Total utility cost	[$/yr]	84,096	75,288	8,808	10.47
Financial	Total project cost	[$]	0	60,000	-60,000	-
	Simple payback period	[yr]	-	6.8	-	-

5.16 Recommendations

Table 11 summarizes the results of the utility use baseline and measure analyses.

Table 11: Measure Analysis Results Summary

Measure name	Final recommendation	Electricity use from grid	Grid electricity use reduction	Electricity peak reduction	Natural gas use	Natural gas use reduction	Total GHG emissions	GHG emissions reduction	Total utility cost	Utility cost reduction	Total project cost	Simple payback period
-	-	[kWh/yr]	[%]	[%]	[m3/yr]	[%]	[tCO2e/yr]	[%]	[$/yr]	[%]	[$]	[yr]
Baseline		392,567	0.0	0.0	62,101	0.0	134.0	0.0	84,096	0.0	0	-
Occupancy schedule optimization	Optional	162,518	58.6	0.0	26,860	56.7	57.7	57.0	35,282	58.0	5,000	0.1
Run around loop	Optional	392,195	0.1	3.5	40,544	34.7	93.1	30.6	75,288	10.5	60,000	6.8

It is recommended to further investigate and review occupancy and HVAC equipment control schedules throughout the Hamilton City Hall. These measures have potential for large energy savings if the equipment is currently ON 24/7 or if an occupancy schedule has been overridden and the equipment is being forced ON. Typically, control optimization measures have a low implementation cost leading to short payback periods.

5.17 Glossary

Typical terms and acronyms that may be used in this report are defined as follows:

AHU: Air handling unit.
C: Cooling.
D: Damper.
dcml: Decimal (e.g. as opposed to percent).
DHW: Domestic hot water.
DX: Direct expansion.
EAD: Exhaust air damper.
EAT: Exhaust air temperature.
FBD: Face and bypass damper.
FBPD: Face and bypass damper.
H: Heating.
HRGRT: Heat recovery glycol return temperature.
HRGST: Heat recovery glycol supply temperature.
HU: Humidity.
MAD: Mixed air damper.
MADC: Mixed air damper control.
MAHU: Mixed air humidity.
MAHUSP: Mixed air humidity setpoint.
MAT: Mixed air temperature.
MATSP: Mixed air temperature setpoint.
MAU: Makeup air unit.
MLF: Master list of findings.
OA: Outside air.
OAD: Outsider air damper.
OAHU: Outside air humidity.
OAT: Outside air temperature.
PAT: Preheated air temperature.
RAD: Return air damper.
RAHU: Return air humidity.
RAHU: Return air humidity setpoint.
RAT: Return air temperature.
RATSP: Return air temperature setpoint.
RMT: Room temperature.
RMTSP: Room temperature setpoint.
SAHU: Supply air humidity.
SAHUSP: Supply air humidity setpoint.
SAT: Supply air temperature.
SATSP: Supply air temperature setpoint.
SP: Space / setpoint.
SPHU: Space humidity.
SPHUSP: Space humidity setpoint.
SPT: Space temperature.
SPTSP: Space temperature setpoint.
T: Temperature.