# PROPOSED STACKED TOWNHOUSE DEVELOPMENT
# 4280 FOURTH AVENUE, NIAGARA FALLS

## FUNCTIONAL SERVICING DESIGN BRIEF
## NEW STORM, SANITARY AND WATER SERVICES

REV 0 – November 15, 2023

PREPARED BY:

HALLEX PROJECT #230913


HALLEX NIAGARA
4999 VICTORIA AVENUE
NIAGARA FALLS, ON L2E 4C9

HALLEX HAMILTON
745 SOUTH SERVICE ROAD, UNIT 205
STONEY CREEK, ON L8E 5Z2

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# 1. INTRODUCTION

The proposed townhouse development consists of the demolition of the existing ball hockey courts and pro shop complete with asphalt & gravel parking areas & laneways and grass areas and the construction of five blocks of stacked townhouses, asphalt laneway and parking areas and grass areas. This development is located at 4280 Fourth Avenue, which is north of the Hamilton Street and Fourth Avenue intersection in the City of Niagara Falls, ON.

The purpose of the service assessment is to determine the functional sizing of the proposed storm, sanitary and water services in addition to the post-development flows from the site to determine the impact on the existing municipal infrastructure.

# 2. EXISTING MUNICIPAL INFRASTRUCTURE

## 2.1 EXISTING SITE DRAINAGE

The existing site currently drains partly to Fourth Avenue via overland flow and sewers and partly towards the east property via overland flow as per the Topographic Survey completed by MTE Ontario Land Surveyors Ltd. under project number 52013-100 T1, dated September 20, 2022. The site drainage towards Fourth Avenue ultimately drains to the existing storm sewer in the street. The overland flow to the east property ultimately appears to drain through the adjacent property and continues easterly beyond the site.

## 2.2 STORM SEWER

The existing site is currently serviced with a 100mm storm lateral connection to Fourth Avenue as it consisted of the existing ball hockey courts and pro shop. The existing drainage infrastructure at Fourth Avenue consists of a 600mm concrete municipal storm sewer which drains southerly towards Hamilton Street.

## 2.3 SANITARY SEWER

The existing site is currently serviced with a sanitary lateral connection to Fourth Avenue as it consisted of the existing ball hockey courts and pro shop, however the size and location of the existing sanitary lateral is unknown. The existing sanitary infrastructure at Fourth Avenue consists of a 600mm concrete municipal sanitary sewer which drains southerly towards Hamilton Street.

## 2.4 WATERMAIN

The existing site is currently serviced with a water service connection to Fourth Avenue as it consisted of the existing ball hockey courts and pro shop, however the size of the existing water service is unknown. The existing watermain infrastructure at Fourth Avenue consists of a 300mm PVC municipal watermain.

# 3. STORM SEWER SYSTEM

## 3.1 PRE-DEVELOPMENT SITE FLOW

The total drainage area for the subject development is 0.727 hectares with an existing runoff coefficient of 0.63 based on the existing roof, asphalt, gravel, and grass surfaces. The catchment area plan for the pre-development site condition is provided on Hallex Sketch CSK1, attached.

Utilizing the rationale method (Q = CiA/360) and the minimum recommended time of concentration of 10 minutes, the allowable peak flow for the pre-development site is as follows:

| Storm Event | Pre-Development Storm Flow to Fourth Avenue | Pre-Development Storm Flow to East Property |
|---|---|---|
| 5-year Storm | 68.5 L/s | 38.5 L/s |

These flows are calculated using the City of Niagara Falls intensity-duration-frequency curves. The pre-development flows for the proposed development are provided in Exhibit #1 for the five-year storm, attached.

## 3.2 POST-DEVELOPMENT SITE FLOW

The proposed development includes the five blocks of stacked townhouses, asphalt laneway and parking areas, and grass areas. The grading for the site will ensure drainage through the proposed storm sewer for storm water quantity and quality controls. The total drainage for the site consists of 0.727 hectares with a calculated runoff coefficient of 0.78 based on the proposed roof, asphalt, and grass surfaces. The proposed storm sewer for the site will then discharge to the existing 600mm municipal storm sewer at Fourth Avenue. The catchment area plan for the post-development site condition is provided on Hallex Sketch CSK2, attached.

Utilizing the rationale method (Q = CiA/360) and the minimum recommended time of concentration of 10 minutes, the calculated peak flow for the post-development site is as follows:

| Storm Event | Post-Development Storm Flow to Fourth Avenue | Post-Development Storm Flow to East Property |
|---|---|---|
| 5-year Storm | 132.0 L/s | 0.0 L/s |

These flows are calculated using the City of Niagara Falls intensity-duration-frequency curves. The post-development flows for the proposed development are provided in Exhibit #7 for the five-year storm, attached.

## 3.3 STORMWATER QUANTITY CONTROL

The post-development storm water runoff to the east property will be eliminated by the development. As such, storm water quantity controls are not required for this drainage area.

The post-development storm water runoff to Fourth Avenue will increase by 63.5 L/s for the five-year storm from the maximum allowable flow from the site. As such, storm water detention will be required for the proposed development.

Stormwater quantity controls for the site can be achieved by utilizing an orifice plate within a manhole prior to discharging to the existing 600mm municipal storm sewer at Fourth Avenue. The orifice plate will ensure the combined post development runoff is controlled to the pre-development runoff rate for the five-year storm event. The resulting 76.0 $m^3$ volume generated for the five-year storm event, can be stored within a proposed underground storage chamber system, a storm sewer system consisting of oversized storm sewers, catchbasins / manholes and/or temporary surface ponding prior to discharging to the existing 600mm municipal storm sewer at Fourth Avenue.

### 3.4 STORMWATER QUALITY CONTROL

Stormwater quality controls for the site can be achieved by utilizing a HydroDome HD5 prior to draining to the existing 600mm municipal storm sewer at Fourth Avenue. This will achieve a total suspended solids removal of at least 70% based on the above post-development site conditions. This value is equivalent to the required 'Normal' treatment of 70% as indicated in the MOE Stormwater Management Planning and Design Manual, dated March 2003 (refer to Chapter 3: Environmental Design Criteria, Section 3.3.1.1. Level of Protection).

## 4. SANITARY SEWER SYSTEM

Given the site is to be completely redeveloped for the proposed stacked townhouse development, all existing sanitary laterals are to be located, capped and abandoned as required at the municipal sanitary sewer. A new sanitary lateral shall be proposed from the site to the existing 600mm concrete municipal sanitary sewer at Fourth Avenue.

The building development is currently in the concept phase; therefore, the following assumptions based on the architectural drawings are made in carrying out the calculations:

- The domestic sewage design flow is based on the recommendation in Section 5.5.2.1 - Domestic Sewage Flows of the Ministry of the Environment Design Guidelines for Sewage Works 2008.
- The five-block stacked townhouse development consists of 72 two-bedroom townhouse units. Each townhouse is assumed to have a maximum of 2 persons per bedroom.

The peak dry weather design flow for the proposed stacked townhouse development is determined to be 6.129 L/s. The peak wet weather design flow for the proposed development is determined to be 6.420 L/s. These calculations are based on the Sanitary Catchment Area Plan CSK3 and the Sanitary Sewer Design Sheet provided in Exhibit #3, attached.

Based on the above, Hallex recommends a minimum 200mm diameter sanitary sewer @ 0.6% to be installed to convey sanitary flows from the proposed stacked townhouse development to the existing 600mm diameter municipal sanitary sewer at Fourth Avenue.

## 5. WATER DISTRIBUTION SYSTEM

Given the site is to be completely redeveloped for the proposed stacked townhouse development, all existing water services are to be located, capped and abandoned as required at the municipal watermain. A new water service shall be proposed from the site to the existing 300mm PVC municipal watermain at Fourth Avenue.

The building development is currently in the concept phase; therefore, the following assumptions based on the architectural drawings are made in carrying out the calculations:

- The domestic average daily water demand is based on Section 3.4.2. Domestic Water Demands of the Ministry of the Environment Design Guidelines for Drinking-Water Systems 2008.
- The peaking factors are based on the recommendation in Table 3-1: Peaking Factors of the Ministry of the Environment Design Guidelines for Drinking-Water Systems 2008.
- The five-block stacked townhouse development consists of 72 two-bedroom townhouse units. Each townhouse is assumed to have a maximum of 2 persons per bedroom.
- Each townhouse block is assumed to be of wood-frame construction and will not have sprinklers installed throughout the building.

The domestic water demand for the subject development is calculated as follows:

| Site | Average Day Water Demand | Maximum Day Water Demand | Peak Hour Water Demand |
|---|---|---|---|
| Area.1 | 150.0 $m^3$/day | 412.4 $m^3$/day | 25.1 L/s |

The resulting domestic flow head losses for the development are determined to be 15.64 kPa (2.27 psi) for the site. As such, the minimum working pressure within the existing municipal watermain is required to be 42.27 psi to ensure a minimum normal operating pressure of 40 psi within the municipal watermain. These calculations are based on the Water Demand Design Sheet provided in Exhibit #4, attached.

Using the calculations provided in the Fire Underwriters Survey – 2020 Water Supply for Public Fire Protection, the minimum water supply flow rate for fire protection is determined to be:

- 15,000 L/min for Block A
- 14,000 L/min for Block B
- 15,000 L/min for Block C
- 15,000 L/min for Block D
- 14,000 L/min for Block E

These calculations are based on the above assumptions as shown in Exhibits #5-9, attached.

There are 3 existing municipal fire hydrants located near the site. The first is located immediately adjacent to the west property line on the east side of Fourth Avenue. The second is located approximately 57.7m north of the property on the east side of Fourth Avenue. The third is approximately 87.6m south of the property on the northwest corner of the Fourth Avenue and Hamilton Street intersection. Using the maximum fire flow rate required for the five-block stacked townhouse development, the head loss at the hydrant located adjacent to the site is determined to be 71.94 kPa (10.43 psi). As such, the minimum working pressure within the existing municipal watermain is required to be 30.43 psi to ensure a minimum normal operating pressure of 20 psi within the watermain under fire flow conditions. The above calculations are based on the Water Demand Design Sheet provided in Exhibit #4, attached.

Based on the above, Hallex recommends a minimum 150mm diameter water service to be installed to provide water supply to the proposed stacked townhouse development from the existing 300mm diameter municipal watermain at Fourth Avenue. The 150mm watermain shall be installed with a water meter chamber at the property line of the development. Additionally, a fire hydrant is proposed for the development in accordance with Ontario Building Code requirements.

## 6. CONCLUSION

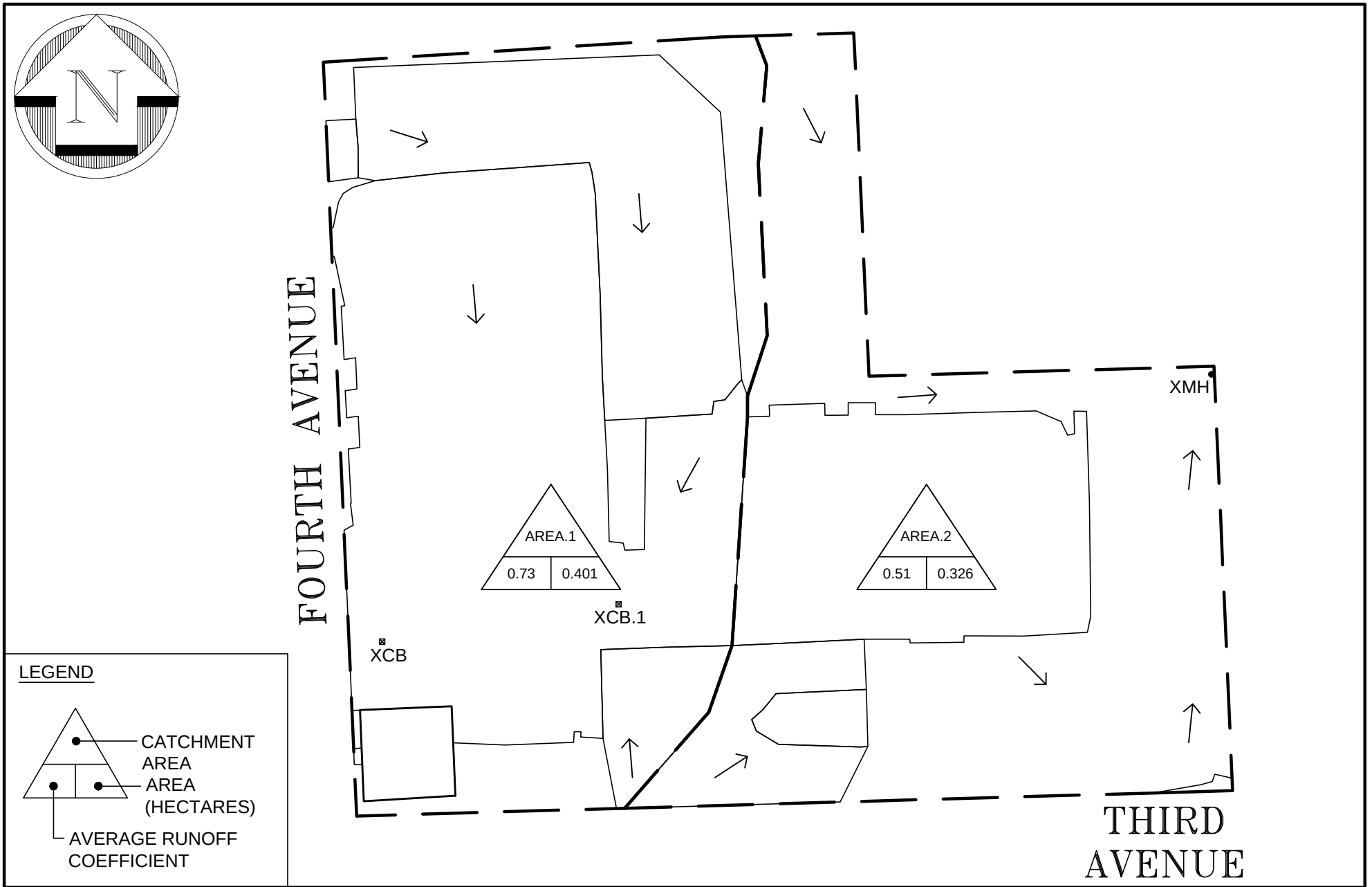
The aforementioned calculations and recommendations for the storm, sanitary and water services are based on the current design for the site as of writing this report. A final sealed report, complete with updates to the recommendations made in this report, may be required based on the final site design.

We trust this report meets your approval. Please contact the undersigned should you have any questions or comments.

Yours truly,
HALLEX ENGINEERING LTD


Jim Halucha P.Eng
Civil/Structural Engineer

Jonathan Skinner, C.E.T., B.Tech
Civil Technologist




LEGEND

CATCHMENT AREA
AREA (HECTARES)
AVERAGE RUNOFF COEFFICIENT

HALLEX ENGINEERING LTD.

4999 Victoria Avenue,
Niagara Falls, ON L2E 4C9
Tel: 905-357-4015 Fax: 905-353-1105

745 South Service Rd. Unit 205,
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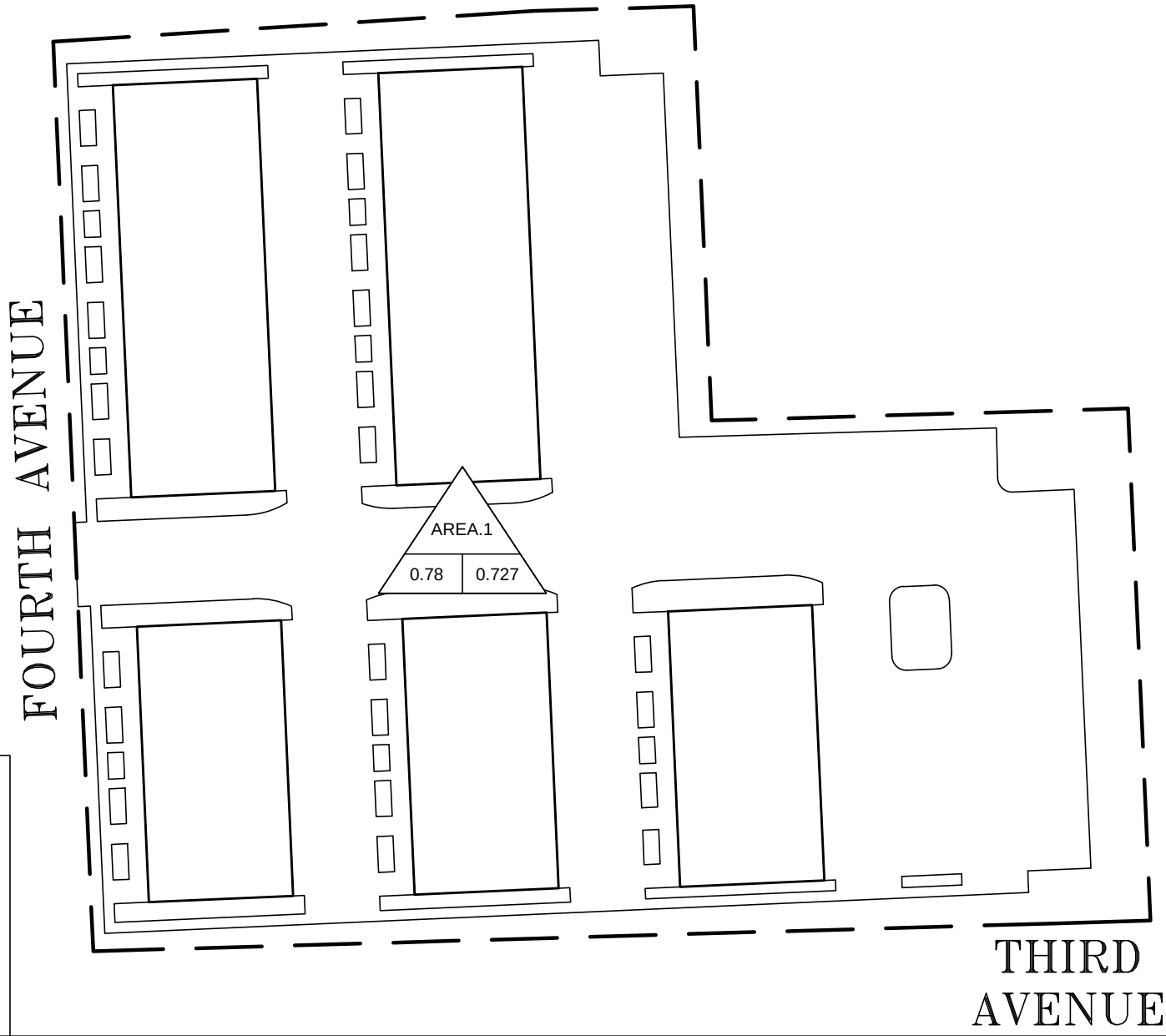
Tel: 905-561-4016 Fax: 905-561-1105

**PROJECT:**
PROPOSED STACKED TOWNHOUSES
4280 FOURTH AVENUE, NIAGARA FALLS, ON

**SHEET TITLE:**
PRE-DEVELOPMENT CATCHMENT AREA PLAN

**DATE:** 11/15/2023
**JOB No.:** 230913
**SCALE:** 1:600
**DWG.** CSK1
**REV.** 0
**DR. BY:** JF
**CH. BY:** JS/ JH




LEGEND

CATCHMENT AREA
AREA (HECTARES)
AVERAGE RUNOFF COEFFICIENT

HALLEX ENGINEERING LTD.

4999 Victoria Avenue,
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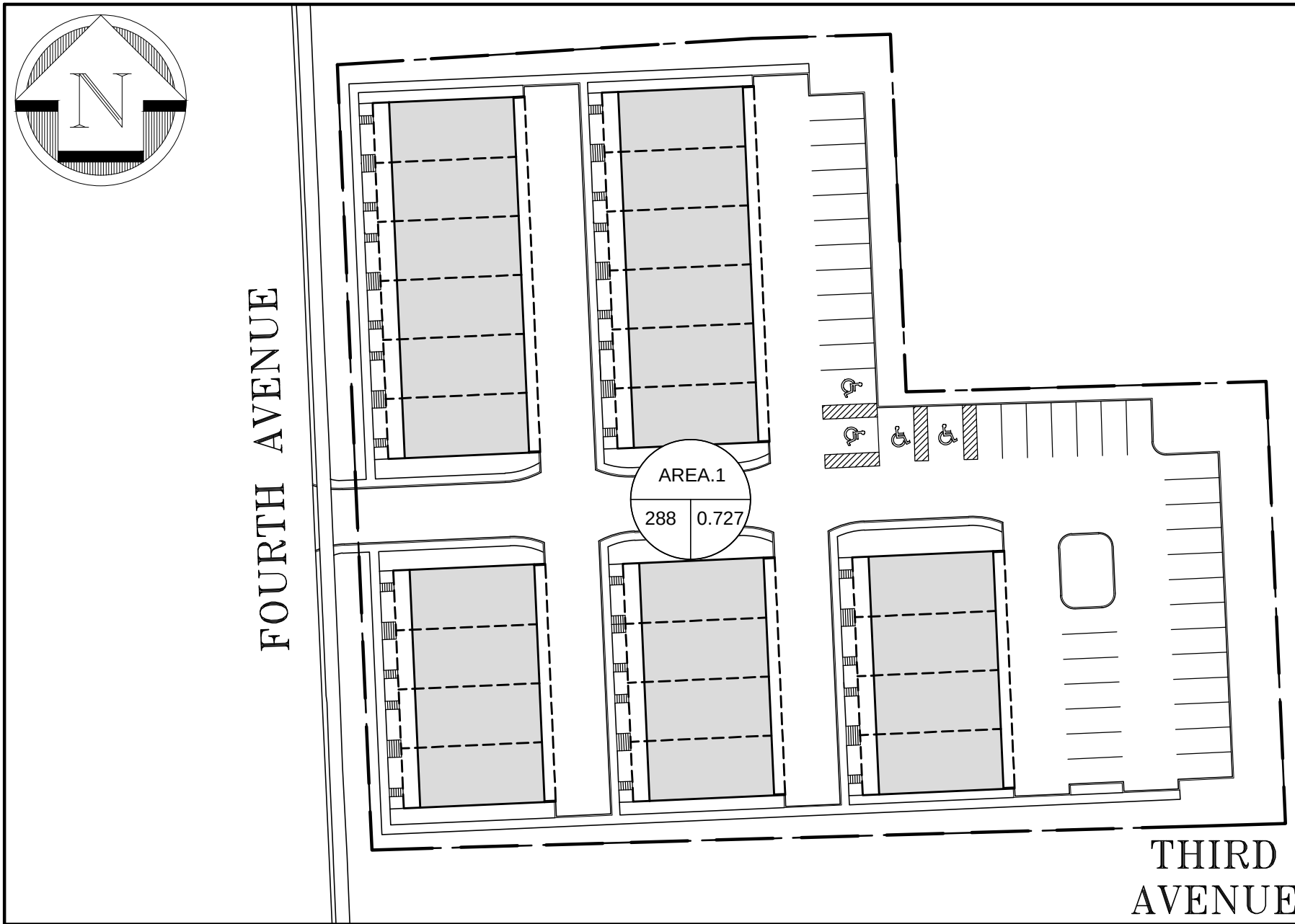
**PROJECT:**
PROPOSED STACKED TOWNHOUSES
4280 FOURTH AVENUE, NIAGARA FALLS, ON

**SHEET TITLE:**
POST-DEVELOPMENT CATCHMENT AREA PLAN

**DATE:** 11/15/2023
**JOB No.:** 230913
**SCALE:** 1:600
**DWG.** CSK2
**REV.** 0
**DR. BY:** JF
**CH. BY:** JS/ JH

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**PROJECT:**
PROPOSED STACKED TOWNHOUSES
4280 FOURTH AVENUE, NIAGARA FALLS, ON

**SHEET TITLE:**
SANITARY CATCHMENT AREA PLAN

**DATE:** 11/15/2023
**SCALE:** 1:600
**DR. BY:** JF
**CH. BY:** JS/ JH

**JOB No.:** 230913
**DWG.** CSK3
**REV.** 0

# Fourth Avenue Stacked Townhouses
# Exhibit #1 - 5 Year Pre - Development Calculations

11/15/2023
Job: 230913

MUNICIPALITY: **Niagara Falls**

manning's n = 0.013 Conc Pipe
0.013 PVC Pipe
0.024 Corr. Stl Pipe

Rainfall Intensity Values = A= 719.500
B= 6.340
C= 0.769

| Location | | | Length of Pipe | Area | | Flow Time | | Rainfall Intensity | Unit rate of Runoff | Design Flows | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe | From Node | To Node | | Incre-ment | Cum Total | To Upper | In Sectio | | | Cum Flow | Cum Flow |
| | | | (m) | (ha) | (ha) | (min) | (min) | mm/hr | $m^3$/ha*day | ($m^3$/d) | ($m^3$/s) |
| **1** | **Area.1** | **Street** | **N/A** | **0.401** | **0.401** | **10.00** | **N/A** | **84** | **60497** | **5916.6** | **0.0685** |
| Roof | - | - | - | 0.011 | - | - | - | - | 19157.5 | 210.7 | - |
| Paved | - | - | - | 0.225 | - | - | - | - | 18149.2 | 4083.6 | - |
| Gravel | - | - | - | 0.112 | - | - | - | - | 12099.5 | 1355.1 | - |
| Grass | - | - | - | 0.053 | - | - | - | - | 5041.4 | 267.2 | - |
| **2** | **Area.2** | **Prpty** | **N/A** | **0.326** | **0.326** | **10.00** | **N/A** | **84** | **60497** | **3329.4** | **0.0385** |
| Roof | - | - | - | 0.000 | - | - | - | - | 19157.5 | 0.0 | - |
| Paved | - | - | - | 0.113 | - | - | - | - | 18149.2 | 2050.9 | - |
| Gravel | - | - | - | 0.029 | - | - | - | - | 12099.5 | 350.9 | - |
| Grass | - | - | - | 0.184 | - | - | - | - | 5041.4 | 927.6 | - |

Run-off Coefficients Used:

| | | |
|---|---|---|
| Roof Structure | C = | 0.95 |
| Paved Surface | C = | 0.90 |
| Gravel Surface | C = | 0.60 |
| Grass Surface | C = | 0.25 |

Velocity Range:

| | | |
|---|---|---|
| Minimum Velocity = | 0.80 | m/s |
| Maximum Velocity = | 6.00 | m/s |

Time of Concentration = 10 min

4999 Victoria Avenue
Niagara Falls, ON L2E 4C9



745 South Service Road, Unit 205
Stoney Creek, ON L8E 5Z2

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# Fourth Avenue Stacked Townhouses
## Exhibit #2 - 5 Year Post - Development Calculations

11/15/2023
Job: 230913

MUNICIPALITY: **Niagara Falls**

Rainfall Intensity Values =

| | |
|---|---|
| A= | 719.500 |
| B= | 6.340 |
| C= | 0.769 |

| Location | | | Length of Pipe | Area | | Flow Time | | Rainfall Intensity | Unit rate of Runoff | Design Flows | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe | From Node | To Node | | Incre-ment | Cum Total | To Upper | In Section | | | Cum Flow | Cum Flow |
| | | | (m) | (ha) | (ha) | (min) | (min) | mm/hr | $m^3$/ha*day | ($m^3$/d) | ($m^3$/s) |
| **1** | **Area 1** | **Street** | **N/A** | **0.727** | **0.727** | **10.00** | **N/A** | **84** | **42348** | **11405.8** | **0.1320** |
| Roof | - | - | - | 0.215 | - | - | - | - | 19157.5 | 4118.9 | - |
| Paved | - | - | - | 0.359 | - | - | - | - | 18149.2 | 6515.6 | - |
| Grass | - | - | - | 0.153 | - | - | - | - | 5041.4 | 771.3 | - |

Run-off Coefficients Used:

| | | |
|---|---|---|
| Roof Structure | C = | 0.95 |
| Paved Surface | C = | 0.90 |
| Gravel Surface | C = | 0.60 |
| Grass Surface | C = | 0.25 |

Velocity Range:

| | | |
|---|---|---|
| Minimum Velocity = | 0.80 | m/s |
| Maximum Velocity = | 6.00 | m/s |

Time of Concentration:

Time of Concentration = 10 min

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# Fourth Avenue Stacked Townhouses
# Exhibit #3 - Sanitary Sewer Design Sheet

11/15/2023
Job: 230913

Niagara Falls

manning's n = 0.013 PVC Pipe
0.013 Conc Pipe
0.024 Corr. Stl Pipe

| Location | | | Length | INDIVIDUAL | | | CUMULATIVE | | M | Q (p) | Q (i) | Q | Sewer Design | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe | From Node | To Node | | Res. Pop. $P_r$ | Res. Area | Area Type | Res. Pop. $P_r$ | Res. Area | | | | | Slope | Capacity Full | Velocity Full | Dia- meter |
| | | | (m) | | (ha) | | | (ha) | | (L/s) | (L/s) | (L/s) | (m/m) | (L/s) | (m/s) | (m) |
| 1 | Area. 1 | Street | N/A | 288 | 0.727 | Multi-Family | 288 | 0.727 | 4.09 | 6.129 | 0.291 | 6.420 | 0.0060 | 25.406 | 0.809 | 0.200 |

Calculations:

$q_r$ = avg residential daily flow — 450 L/cap.d

I = infiltration allowance — 0.400 L/ha.s

M = residential peaking factor

$P_r$ = residential population

$P_h$ = hotel bed space population

Q (p) = peak population flow (L/s)

Q (i) = peak extraneous flow (L/s)

Q = peak design flow (L/s)

$$M = 1 + \frac{14}{4 + \sqrt{P_r}}$$ where P=population in 1000's

$$Q(p) = \frac{P_r * q_r * M}{86.4}$$ (L/s) where P=population in 1000's

$Q(i) = I * A_r$ (L/s) where A = area in hectares

$Q = Q(p) + Q(i)$ (L/s)

Velocity Range:

Minimum Velocity = 0.60 m/s

Maximum Velocity = 3.00 m/s

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Niagara Falls, ON L2E 4C9

745 South Service Road, Unit 205
Stoney Creek, ON L8E 5Z2

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# Fourth Avenue Stacked Townhouses
## Exhibit #4 - Water Demand

11/15/2023
Job: 230913

Roughness Coefficient = 100 for 150mm pipe
110 for 200-250mm pipe

| Location | | | Length | Pop. | Area | Area Type | Water Demand by Pop'n & | | | Fire Flow | Watermain Design | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe | From Node | To Node | | | | | Average Day | Maximum Day | Peak Hour | | Dia-meter | Dom. Head Loss | Domestic Pressure Loss | | Fire Head Loss | Fire Pressure Loss | |
| | | | (m) | | (ha) | | $m^3$/day | $m^3$/day | L/s | (L/s) | (m) | (m) | (kPa) | (psi) | (m) | (kPa) | (psi) |
| 1 | Area. 1 | Site | 67.5 | 288 | 0.727 | Multi-Family | 150.0 | 412.4 | 25.10 | 0.00 | 0.150 | 1.596 | 15.64 | 2.27 | 0.000 | 0.00 | 0.00 |
| 2 | FH | Site | 4.4 | 0 | 0.000 | Multi-Family | 0.0 | 0.0 | 0.00 | 250.00 | 0.150 | 0.000 | 0.00 | 0.00 | 7.341 | 71.94 | 10.43 |

Calculations:

| | | | |
|---|---|---|---|
| Avg Daily Water Demand (Domestic) | 0.450 $m^3$/cap./day | Max Day Factor | 2.75 |
| Fluid Specific Weight | 9.8 $kN/m^3$ | Max Hourly Peaking Factor | 4.13 |

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# Fourth Avenue Stacked Townhouses
# Exhibit #5 - Fire Water Demand - Block A

11/15/2023
Job: 230913

## FIRE WATER SUPPLY

Building Type: No Fire Protection

| Floor Area | | | Reduct. | |
|---|---|---|---|---|
| First Floor | 537.9 | $m^2$ | 1.00 | 537.9 $m^2$ |
| Second Floor | 537.9 | $m^2$ | 1.00 | 537.9 $m^2$ |
| Third Floor | 537.9 | $m^2$ | 1.00 | 537.9 $m^2$ |
| | | | | 1613.7 $m^2$ |

Construction Type: Wood Frame Construction

Construction Coefficient: 1.5

1st Preliminary Fire Flow = 13000 L/min

Fire Hazard: Limited Combustible

Fire Hazard Factor: -0.15

Net Decrease = -1950 L/min

2nd Preliminary Fire Flow = 11050 L/min

Sprinkler System: No System

Sprinkler System Factor: 0.0

No Change = 0 L/min

Separation Factor

| | | | |
|---|---|---|---|
| North | 45+ | m | 0.00 |
| South | 12.5 | m | 0.15 |
| West | 30.2 | m | 0.05 |
| East | 11.5 | m | 0.15 |
| | | | 0.35 |

Net Increase = 3867.5 L/min

**FINAL FIRE FLOW = 15000.0 L/min**

Minimum Water Supply Flow Rate for Fire Protection as determined by the Water Supply For Public Fire Protection, dated 1999, by the Fire Underwriter's Survey

4999 Victoria Avenue
Niagara Falls, ON L2E 4C9

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Stoney Creek, ON L8E 5Z2

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# Fourth Avenue Stacked Townhouses
# Exhibit #6 - Fire Water Demand - Block B

11/15/2023
Job: 230913

FIRE WATER SUPPLY

Building Type: No Fire Protection

| Floor Area | | Reduct. | |
|---|---|---|---|
| First Floor | 537.9 $m^2$ | 1.00 | 537.9 $m^2$ |
| Second Floor | 537.9 $m^2$ | 1.00 | 537.9 $m^2$ |
| Third Floor | 537.9 $m^2$ | 1.00 | 537.9 $m^2$ |
| | | | 1613.7 $m^2$ |

Construction Type: Wood Frame Construction

Construction Coefficient: 1.5

1st Preliminary Fire Flow = 13000 L/min

Fire Hazard: Limited Combustible

Fire Hazard Factor: -0.15

Net Decrease = -1950 L/min

2nd Preliminary Fire Flow = 11050 L/min

Sprinkler System: No System

Sprinkler System Factor: 0.0

No Change = 0 L/min

Separation Factor

| | | |
|---|---|---|
| North | 45+ m | 0.00 |
| South | 12.5 m | 0.15 |
| West | 11.5 m | 0.15 |
| East | 45+ m | 0.00 |
| | | 0.30 |

Net Increase = 3315 L/min

**FINAL FIRE FLOW = 14000.0 L/min**

Minimum Water Supply Flow Rate for Fire Protection as determined by the Water Supply For Public Fire Protection, dated 1999, by the Fire Underwriter's Survey

4999 Victoria Avenue
Niagara Falls, ON L2E 4C9



745 South Service Road, Unit 205
Stoney Creek, ON L8E 5Z2

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# Fourth Avenue Stacked Townhouses
# Exhibit #7 - Fire Water Demand - Block C

11/15/2023
Job: 230913

## FIRE WATER SUPPLY

Building Type: No Fire Protection

| Floor Area | | | Reduct. | |
|---|---|---|---|---|
| First Floor | 359.7 | $m^2$ | 1.00 | 359.7 $m^2$ |
| Second Floor | 359.7 | $m^2$ | 1.00 | 359.7 $m^2$ |
| Third Floor | 359.7 | $m^2$ | 1.00 | 359.7 $m^2$ |
| | | | | 1079.1 $m^2$ |

Construction Type: Wood Frame Construction

Construction Coefficient: 1.5

1st Preliminary Fire Flow = 11000 L/min

Fire Hazard: Limited Combustible

Fire Hazard Factor: -0.15

Net Decrease = -1650 L/min

2nd Preliminary Fire Flow = 9350 L/min

Sprinkler System: No System

Sprinkler System Factor: 0.0

No Change = 0 L/min

Separation Factor

| | | | |
|---|---|---|---|
| North | 12.5 | m | 0.15 |
| South | 5.1 | m | 0.20 |
| West | 29.6 | m | 0.10 |
| East | 11.5 | m | 0.15 |
| | | | 0.60 |

Net Increase = 5610 L/min

**FINAL FIRE FLOW = 15000.0 L/min**

Minimum Water Supply Flow Rate for Fire Protection as determined by the Water Supply For Public Fire Protection, dated 1999, by the Fire Underwriter's Survey

4999 Victoria Avenue
Niagara Falls, ON L2E 4C9

745 South Service Road, Unit 205
Stoney Creek, ON L8E 5Z2

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# Fourth Avenue Stacked Townhouses
# Exhibit #8 - Fire Water Demand - Block D

11/15/2023
Job: 230913

## FIRE WATER SUPPLY

Building Type: No Fire Protection

| Floor Area | | | Reduct. | |
|---|---|---|---|---|
| First Floor | 359.7 | $m^2$ | 1.00 | 359.7 $m^2$ |
| Second Floor | 359.7 | $m^2$ | 1.00 | 359.7 $m^2$ |
| Third Floor | 359.7 | $m^2$ | 1.00 | 359.7 $m^2$ |
| | | | | 1079.1 $m^2$ |

Construction Type: Wood Frame Construction

Construction Coefficient: 1.5

1st Preliminary Fire Flow = 11000 L/min

Fire Hazard: Limited Combustible

Fire Hazard Factor: -0.15

Net Decrease = -1650 L/min

2nd Preliminary Fire Flow = 9350 L/min

Sprinkler System: No System

Sprinkler System Factor: 0.0

No Change = 0 L/min

Separation Factor

| | | | |
|---|---|---|---|
| North | 12.5 | m | 0.15 |
| South | 4.3 | m | 0.20 |
| West | 11.5 | m | 0.15 |
| East | 11.5 | m | 0.15 |
| | | | 0.65 |

Net Increase = 6077.5 L/min

**FINAL FIRE FLOW = 15000.0 L/min**

Minimum Water Supply Flow Rate for Fire Protection as determined by the Water Supply For Public Fire Protection, dated 1999, by the Fire Underwriter's Survey

4999 Victoria Avenue
Niagara Falls, ON L2E 4C9



745 South Service Road, Unit 205
Stoney Creek, ON L8E 5Z2

HALLEX ENGINEERING LTD.

# Fourth Avenue Stacked Townhouses
# Exhibit #9 - Fire Water Demand - Block E

11/15/2023
Job: 230913

## FIRE WATER SUPPLY

Building Type: No Fire Protection

| Floor Area | | | Reduct. | |
|---|---|---|---|---|
| First Floor | 359.7 | $m^2$ | 1.00 | 359.7 $m^2$ |
| Second Floor | 359.7 | $m^2$ | 1.00 | 359.7 $m^2$ |
| Third Floor | 359.7 | $m^2$ | 1.00 | 359.7 $m^2$ |
| | | | | 1079.1 $m^2$ |

Construction Type: Wood Frame Construction

Construction Coefficient: 1.5

1st Preliminary Fire Flow = 11000 L/min

Fire Hazard: Limited Combustible

Fire Hazard Factor: -0.15

Net Decrease = -1650 L/min

2nd Preliminary Fire Flow = 9350 L/min

Sprinkler System: No System

Sprinkler System Factor: 0.0

No Change = 0 L/min

Separation Factor

| | | | |
|---|---|---|---|
| North | 17.5 | m | 0.15 |
| South | 8.0 | m | 0.20 |
| West | 11.5 | m | 0.15 |
| East | 36.8 | m | 0.05 |
| | | | 0.55 |

Net Increase = 5142.5 L/min

**FINAL FIRE FLOW = 14000.0 L/min**

Minimum Water Supply Flow Rate for Fire Protection as determined by the Water Supply For Public Fire Protection, dated 1999, by the Fire Underwriter's Survey