DILLON CONSULTING

DAEI FOODS INC.

131 & 135 Sandwich Street Functional Servicing Study

Draft Report

April 2022 – 22-3783

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1.0 Introduction

Dillon Consulting Limited (Dillon) was retained by Nicholas Caragianis Architect Inc. and Daei Foods to develop a functional servicing strategy for the property at 131/135 Sandwich St. (the "Site") in the Town of Amherstburg. This document outlines the servicing strategy including supporting studies and related information for the sanitary, stormwater management, and watermain servicing for the Site.

The proposed development is 0.2 hectares (Ha.) and consists of a commercial building for restaurant use with an area of 420m^2 (0.042 ha.) and a parking lot with drive-through area of 1580m^2 (0.158 ha.).

1.1 References Documents

The following documents and drawings were referenced when completing this study:

- Corporation of the Town of Amherstburg – Development Manual (Amherstburg, 2009)
- Town of Amherstburg - Interactive Mapping (Amherstburg)
- Design Guidelines for Sewage Works (MOE, 2008)
- Windsor/Essex Region Stormwater Management Standards Manual (2018)
- Design Guidelines for Drinking-Water Systems (MOE, 2008)

2.0 Site Area

2.1 Existing Conditions

The current site spans across two properties, 131 and 135 Sandwich Street. There is a restaurant on 131 Sandwich Street that is no longer in operation with its own parking lot. Adjacent is 135 Sandwich Street, which consists of mainly gravel and is used as a parking lot with a metal clad garage at the eastern end. The existing site is mainly asphalt and gravel with very little grassed area.

Access to the existing site is via a gravel driveway from Sandwich Street near the southwest property limits on 135 Sandwich Street. There is an asphalt driveway at the north end onto 131 Sandwich Street which can also be used as access.

The site is located within a commercial area. The site fronts Sandwich Street and is located across from the General Amherst High School. Additional asphalt parking exists adjacent to the Site along the north and east site limits. Additional commercial units are located south of the property.

2.2 Proposed Site Layout

The proposed ingress and egress to this development will be from Sandwich Street from the south, using a proposed new driveway entrance. There will also be a single drive thru exit from this development onto Sandwich Street located at the north-most limit of the Site.

The proposed development includes a single-storey building with three restaurants with a loading area and parking spaces to the south and east of the building respectively. There will be a new transformer located on the northeast corner of the property and a waste storage area at the southeast corner of property. The Site layout is shown in in Appendix A.

There will be a 3 metre (m) landscaped strip at the front of the building with additional 0.9 m landscape strips along the north and south property limit.

3.0 Sanitary Servicing

3.1 Existing Conditions

Currently, there are two existing sanitary services to the Site; one to 131 Sandwich Street, and another sanitary service for 135 Sandwich Street. The existing sanitary service for 131 Sandwich Street currently services the existing building. There is no longer a building on 135 Sandwich Street. It is assumed that the existing sanitary service for 135 Sandwich Street is not in use or abandoned. The municipal sanitary sewer on Sandwich Street is a 550 mm x 700 mm brick combined sanitary sewer, located within the right-of-way of the road and conveys flows south down Sandwich Street. The invert of the existing combined sewer on Sandwich Street was obtained through the use of the Town of Amherstburg's interactive mapping database.

3.2 Existing Conditions

The following sanitary sewer design criteria for this property are outlined in Table 1.0. The design criteria were established by the Town of Amherstburg's Development Manual (2009).

Table 1: Sanitary Sewer Design Criteria

Criteria	Town of Amherstburg Development Manual
Hydraulic Sewer Sizing	Manning's Equation
Minimum Sewer Service Connection Size (mm)	125 diameter
Minimum Cover Depth (m)	1.20
Manning's Roughness Coefficient 'n'	0.013
Velocity: Minimum (m/s) Maximum (m/s)	 0.76 3.66
Hydraulic Losses Across manholes: Straight Run (mm) 45 degree turn of less (mm) Greater than 45 degree turn to 90 degree turn (mm)	 10 50 100
Infiltration Allowance/Peak Extraneous Flow	0.2 L/Ha/s
Peaking Factor	Based on Harmon Formula
Population Densities For: Residential Commercial	 3.5 persons/unit 75 persons/Ha
Average Daily Sewage	450 L/Cap/Day
Sewer Surcharging	Maximum hydraulic grade line with pump failure

3.3 Proposed Servicing

Please refer to the attached Servicing Plan (in Appendix A) which illustrates the proposed sanitary servicing layout. The sanitary servicing for the proposed development is as follows:

- All sanitary flows from within the proposed development will be conveyed via local sanitary sewers constructed within the Site limits.
- A proposed 200 mm PVC sanitary service will be connected to the existing 550 x 700 mm combined sewer on the east side of the centreline on Sandwich Street, southeast of the building. The proposed sanitary service will be offset 6m from the south side of the proposed building.

The sanitary functional design sheets are provided in Appendix B. Criteria used in flow calculation is listed in Table 1.0 above.

The proposed sanitary sewers on-site will have sufficient frost cover and depth for connection at the sanitary mainline in Sandwich Street. The future detailed design of the sanitary sewers and services are to be consistent with the requirements of the Town of Amherstburg and the Ministry of Environment, Conservation and Parks (MECP).

4.0 Stormwater Servicing

4.1 Existing Conditions

Currently, the existing site does not have on-site Stormwater controls. Based on the existing topography, Stormwater runoff is not controlled, and sheet flows away from the existing building and onto Sandwich Street, and the adjacent parking lot to the north. There is an existing 1200 mm dia. concrete storm sewer and conveys flows south along Sandwich Street. The invert of the storm sewer was approximated from existing plan and profile plans of Sandwich Street provided by the Town.

4.2 Design Criteria

The following storm sewer design criteria for this property are outlined in Table 2.0. The design criteria were established by the Town of Amherstburg Development Manual (2009).

Table 2: Storm Sewer Design Criteria

Criteria	Town of Amherstburg's Development Manual
Stormwater Runoff	Hydrodynamic Model
Hydraulic Sewer Sizing	Manning's Equation
Minimum Sewer Size (mm)	150mm diameters
Sewer Sizing Rainfall Event	Windsor-Essex Regional Stormwater Standards - (WERSMS) (2018)
Minimum Cover Depth (m)	1.20
Manning's Roughness Coefficient 'n'	0.013
Velocity: Minimum (m/s) Maximum (m/s)	 0.80 3.66
Roof Downspouts	Disconnected (splash to ground)
Inlet Times: Residential	 15 minutes
Runoff Coefficients: Commercial	 0.7-0.9
Sewer Surcharging	Maximum 5 year hydraulic grade line is below road grade

The proposed development is not located in the ERCA (Essex Region Conservation Authority) Regulated Area.

4.3 Proposed Servicing

The proposed Stormwater management strategy follows the criteria set by the Town of Amherstburg Development Manual and the Windsor-Essex Region Stormwater Management Standards. The criteria is listed as follows:

1. Stormwater Quality Control – Quality Control is to follow Normal Protection Level treatment (70% total suspended solids [TSS] removal)
2. Stormwater Quantity Control – Quantity Control will be restricting the post-development 100-year runoff to the pre-development 5-year runoff.

4.3.1 Stormwater Quality Control

The proposed development will include an Oil & Grit Separator (OGS) unit to meet the stormwater quality control criteria. The OGS will be located at the south driveway and will be upstream of the storm control manhole.

The OGS sizing and design will be completed at the detailed design stage.

4.3.2 Stormwater Quantity Control

The proposed quantity control for this Site is to limit the post-development 100-year runoff from the to the pre-development 5-year runoff rate. The allowable release rate based on the land-use in Table 3 was calculated to be 36.6 L/s.

Table 3: Site Land Use

Pre Development 5-Year		Post Development 100-Year	
Runoff Coefficient (C)	Area	Runoff Coefficient (C)	Area
Asphalt Parking and Driveway (C=0.9)	1,060 m^2	Building, Parking Lot and Walkway (C=0.9)	1,850 m^2
Gravel Parking (C=0.75)	600 m^2	Uncontrolled Landscape Area and Front of Building (C=0.2)	150 m^2
Grass Area (C=0.2)	340 m^2		

The post-development runoff was calculated using a multiplier of 1.25 (applied on larger events) on the rainfall intensity at the 100-year event. As shown in Table 3, there is a small area with uncontrolled runoff. The runoff generated from the rest of the Site is required to be controlled to meet the stormwater criteria. Refer to Appendix C for the Stormwater Management calculations.

On-site storage is proposed in the form of surface ponding as per Town's design standards to detain runoff on-site during the 100-year event. Based on criteria listed in Table 2, the storage requirement was calculated using the Modified Rational Method to be 48.2 m^3. The Site was graded to provide a total available ponding storage of 55.10 m^3. The ponding to achieve the storage volume does not exceed a depth of 0.28 m. This is less than the maximum ponding depth in the Town's design standard of 0.30m for the 100-year event. Refer to the Grading Plan (in Appendix A) for the ponding extents and depth.

An orifice plate will be designed and proposed upstream of the municipal connection at the control manhole. It will be sized to control the release rate to satisfy the quantity criteria. Sizing of the orifice plate will occur at the detailed design stage.

4.4 Proposed Servicing

Refer to Servicing Plan (in Appendix A) for the proposed servicing and the functional design sheets which are provided in Appendix B. The stormwater servicing for the proposed development is as follows:

- The roads and parking space will be graded to allow for overland flow to be captured on-site via catch basins.
- Roof drainage will be directly connected into the onsite storm sewers.
- The proposed storm sewers can be sized with enough depth to provide storm servicing.
- The proposed storm sewers for the development will be connected to the existing 1200mm diam. concrete storm sewer on Sandwich Street.

5.0 Watermain Servicing

5.1 Existing Conditions

Based on the available Town's private drain sheets from December 2008 and topographical survey conducted in October 2021, there is a water service connection for 131 Sandwich Street and 135 Sandwich Street. However, based on the existing topographic survey, there does not appear to be a water service for 135 Sandwich Street. Therefore a water service had been present for 135 Sandwich but is now abandoned or no longer in use.

The closest fire hydrant to the building is across Sandwich Street just south of the school. The existing hydrant is within 75 m of the building and is within a sufficient distance to the main entrance according to Ontario Building Code.

5.2 Design Criteria

Based on information provided by the Client, the peak water demand for the proposed development is 1.64 L/s (26 gpm) for one restaurant unit. Assuming similar peak flows for the three units, a peak flow of 4.92 L/s (78 gpm) has been considered for the whole development.

The design of the watermain services are to be consistent with the requirements of the Town and the Ministry of Environment (MOE) design guidelines.

5.3 Proposed Servicing

Please refer to the attached Servicing Plan (in Appendix A) which illustrates the proposed watermain servicing.

The proposed development will be serviced by a 100 mm diameter watermain connected to the proposed building through the southeast end. The watermain service will be 3 m offset from the proposed building. This new watermain will connect to the existing 300 mm diameter main located on the west side of Sandwich Street right-of-way.

A hydrant flow test has been completed for this development. The fire hydrant across the property of 131/135 Sandwich Street was tested by Wallace-Kent Sprinkler Systems on March 31st, 2022.
The water system for the proposed development is intended for domestic use only. The proposed building is not equipped with a sprinkler system and the design does not include a separate fire line.

Based on the conducted hydrant flow test, the static pressure at the hydrant across from the proposed development on Sandwich Street is 427 kPa (62 psi) and the available fire flow at a residual pressure of 140 kPa (20 psi) is 300 L/s (4757 gpm). Calculating the pressure drop at a peak water demand of 4.92 L/s (78 GPM) for the proposed development results in watermain pressure at the building of 421 kPa (61 psi) , which is above the required pressure of 275 kPa (40 psi). Please refer to Appendix D for the pressure drop calculations and fire flow test.

6.0 Utilities

6.1 Gas

Existing natural gas service is available along Sandwich Street. During detailed design, future conversation on loading will be required with Union Gas by others.

6.2 Bell

Existing Bell service is available along Sandwich Street. Telecommunications servicing will be determined at the detailed design stage by others.

6.3 Hydro

Essex Powerlines Corporation has a hydro pole and guy wires on the east side of the property. A hydro connection for the building will be proposed during the detailed design stage by others.

7.0 Conclusion

The proposed development can be serviced as follows:

- The sanitary and storm sewer can be designed as per Town's Development Manual.
- The sanitary and storm sewer will discharge from the Site into the municipal sanitary and storm sewers on Sandwich Street.
- There is available capacity in the municipal watermain on Sandwich Street to provide domestic demand and can be serviced by a 100 mm diam. watermain.
- Fire protection is available from the existing hydrant across the street with adequate coverage to the building.
- Stormwater quality control can be achieved through an Oil & Grit Separator.
- Stormwater quantity control can be achieved through onsite storage by surface ponding within the parking lot and drive-through.

The design of the proposed internal services will be finalized during detailed design.

Yours sincerely,

DILLON CONSULTING LIMITED

Gary Tran, P.Eng.
Project Engineer

Appendix A

Functional Servicing and Grading Plan

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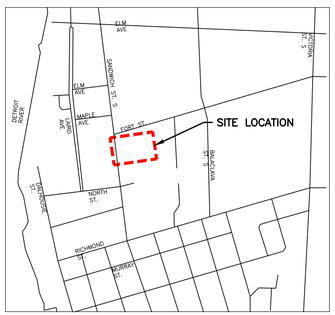
LEGEND:

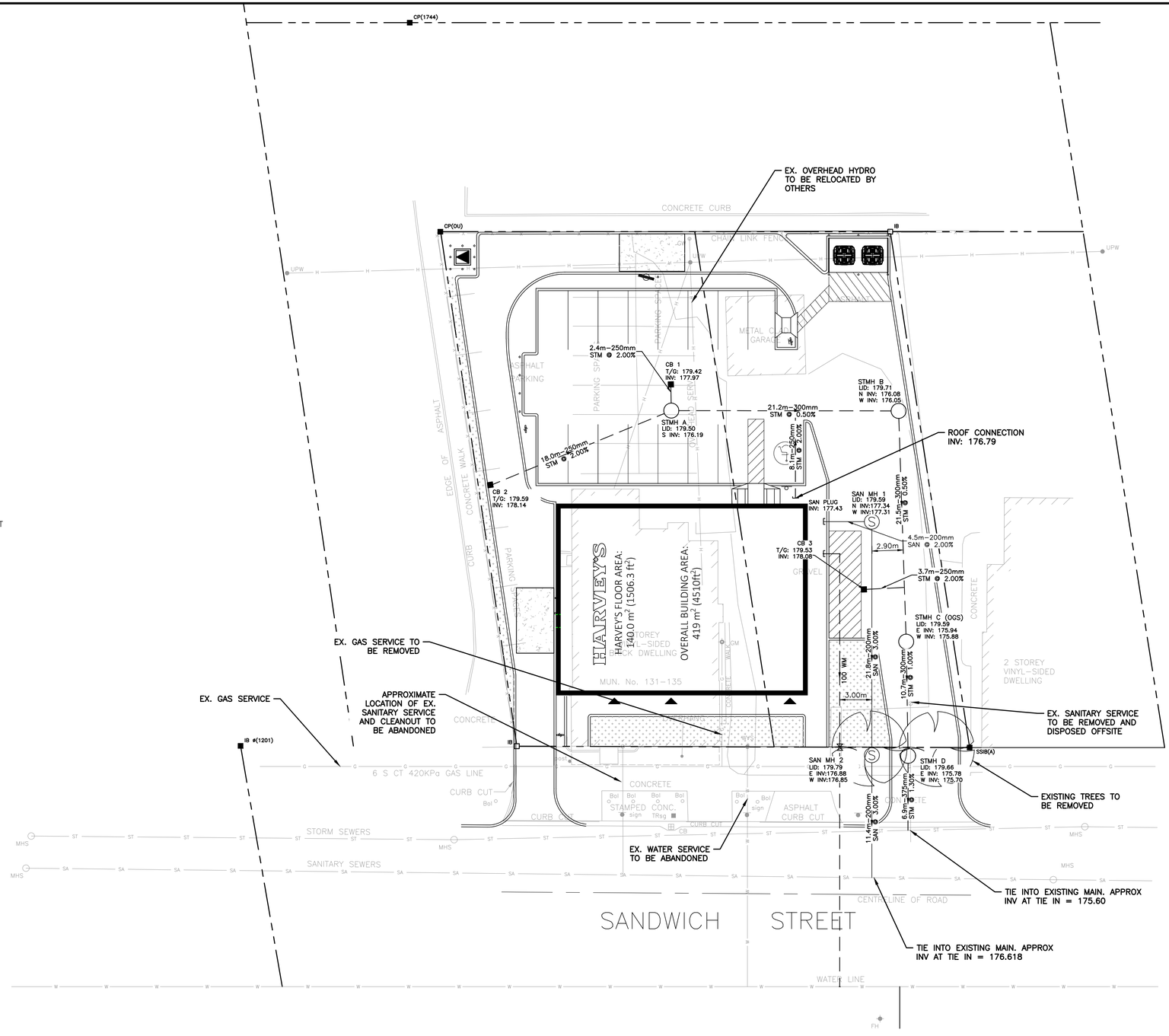
- EX. STM PIPE
- EX. SAN PIPE
- PROP. STM PIPE
- PROP. STM MH
- PROP. SAN PIPE
- PROP. CATCHBASINS
- PROP. SAN MH
- EX. WATER
- PROP. WATER
- EX. CURBS
- PROP. CURBS
- EX. WATER VALVE
- WATER VALVE
- CONCRETE PAD
- PROPERTY LIMIT

GENERAL NOTES:

1. EXISTING ESSEX POWER HYDRO POLE AND GUY ANCHOR IN PROPOSED DRIVE THRU AREA TO BE REMOVED/RELOCATED BY OTHERS. REFER TO ELECTRICAL DRAWINGS.
2. LOCATION OF SANITARY SERVICE CLEAN OUT BASED ON TOWNS AS-BUILT PLAN AND PROFILE AND PRIVATE DRAIN CONNECTION DETAILS.

KEY PLAN:





Conditions of Use

Verify elevations and/or dimensions on drawing prior to use. Report any discrepancies to Dillon Consulting Limited.

Do not scale dimensions from drawing.

Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.

DILLON CONSULTING

No.	ISSUED FOR	DATE	BY
1	FUNCTIONAL SERVICING DESIGN	04/08/2022	D.B.

DESIGN: D.B.	REVIEWED BY: J.J.
DRAWN: D.B.	CHECKED BY: G.T.
DATE: APRIL 2022	
SCALE: 1:200	

131 & 135 SANDWICH STREET SOUTH DEVELOPMENT
TOWN OF AMHERSTBURG

PROJECT NO. 22-3783

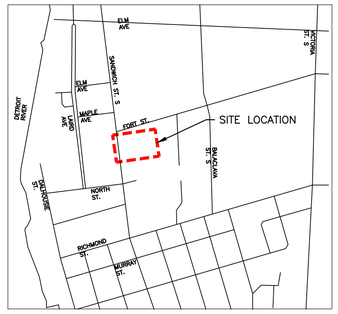
CIVIL
FUNCTIONAL SERVICING PLAN

SHEET NO. SR

DILLON CONSULTING LIMITED 130 DUFFERIN AVENUE, LONDON, ONTARIO, N6A 5R2, PHONE (519) 438-6192, FAX (519) 672-8209

FILENAME: C:\PW_WORKING DIRECTORY\PROJECTS 2022\DILLON_438GS\DMS1347A\223783-02-SR-CON.DWG PLOTTED BY: SIFERO, PLOT DATE: 2022-04-08 @ 8:48:01 AM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

KEY PLAN:

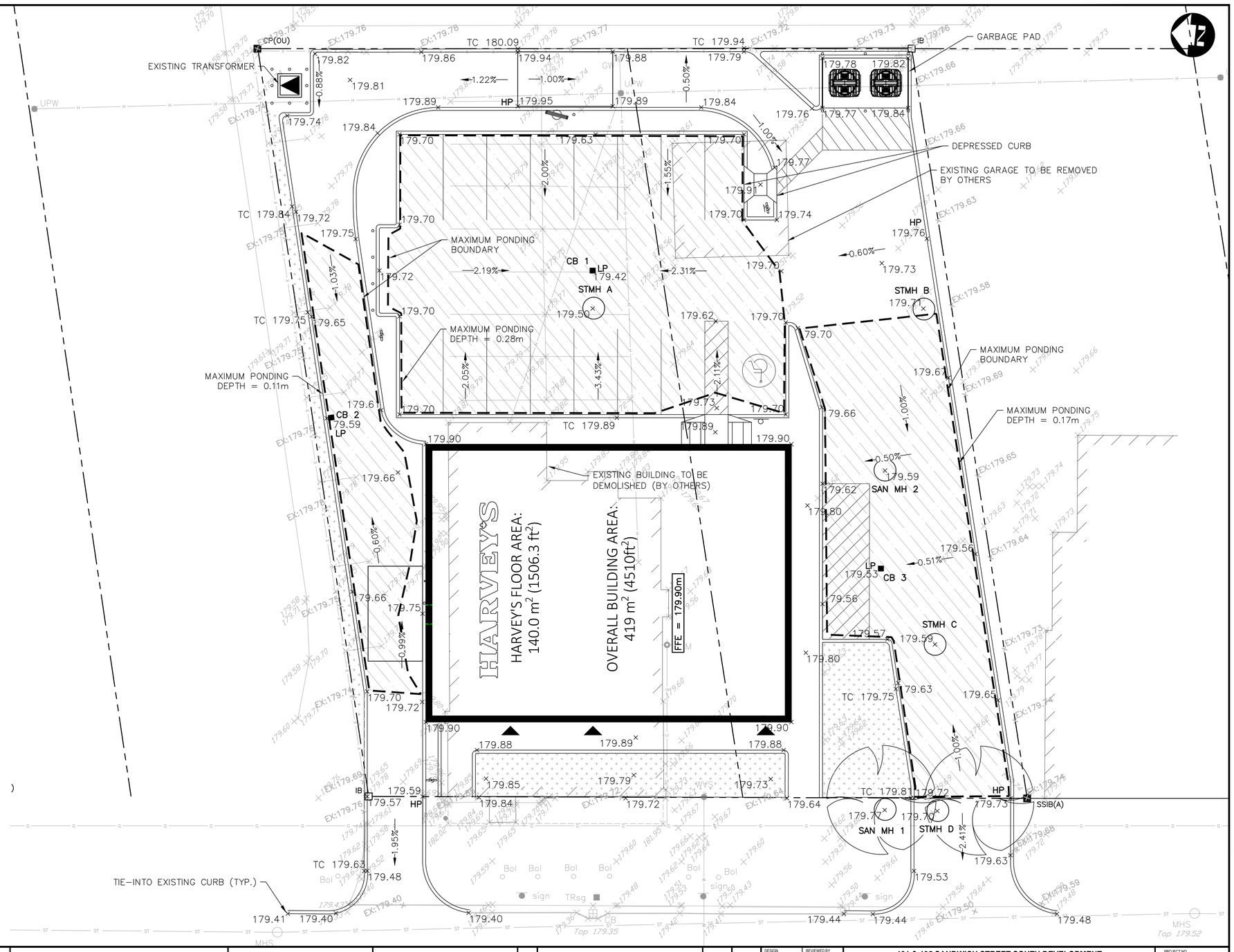


LEGEND:

EX:179.60	EXISTING ELEVATION
179.73	PROPOSED ROAD ELEVATION
TC 179.68	PROPOSED TOP OF CURB ELEVATION
—1.00%—	PROPOSED SLOPE
CB ■	PROPOSED CATCH BASIN
MH ○	PROPOSED MAINTENANCE HOLE
	MAX PONDING BOUNDARY
	PROPERTY LINE

GENERAL NOTES:

1. THE OWNER AND DILLON CONSULTING LIMITED DO NOT GUARANTEE THE ACCURACY OF THE UTILITIES SHOWN ON THE DRAWINGS. OTHER UTILITIES MAY BE PRESENT OR THE UTILITIES SHOWN MAY DIFFER IN SIZE OR LOCATION FROM THOSE SHOWN. THE CONTRACTOR SHALL NOTE THAT LOCATION OF SERVICES FROM THE MAIN LINES ARE APPROXIMATE AS SHOWN. THE CONTRACTOR ASSUMES FULL RESPONSIBILITY TO CONTACT THE VARIOUS UTILITY COMPANIES AND TO REPAIR ANY DAMAGE IT MAY CAUSE TO THESE UTILITIES OR OTHER THIRD PARTIES. THE CONTRACTOR AGREES TO INDEMNIFY THE OWNER AND DILLON CONSULTING LIMITED AGAINST ANY CLAIMS WHICH MAY ARISE FROM THE CONTRACTOR'S ACTIONS.
2. ALL WORK SHALL MEET THE MINIMUM STANDARDS AND SPECIFICATIONS OF THE TOWN OF AMHERSTBURG, WINDSOR–ESSEX REGION, AND ONTARIO PROVINCIAL STANDARDS.
3. PAVEMENT GRADES SHOWN ARE TO EDGE OF PAVEMENT OR CENTER LINE OF ROAD.
4. FINISHED GRADE AT DRIVE–THRU WINDOW TO BE 0.15m BELOW FFE AS STATED ON THE DRAWING.
5. GRADING DESIGNED TO ALLOW FOR SURFACE PONDING WITHIN PARKING AREA. SWM STORAGE REQUIREMENT CALCULATED VIA POST–100 YEAR TO PRE–5 YEAR ANALYSIS COMPARISON. REFER TO FSR FOR FURTHER DETAILS:
   - MAX PONDING DEPTH = 0.28m
   - MAX ALLOWABLE PONDING DEPTH = 0.30m
   - MAX PONDING ELEVATION = 179.70m
   - MAX PONDING VOLUME = 55.10cu.m
   - REQUIRED STORAGE VOLUME = 48.2cu.m
6. ALL PROPOSED CURB TO BE BARRIER STYLE CURB AND CONFORM TO OPSD 600.110
7. ALL GRADES SHOWN ON PLAN ARE BOTTOM OF CURB/ASPHALT ELEVATIONS UNLESS OTHERWISE NOTED. TOP OF CURB ELEVATION TO BE 0.15m HIGHER THAN BOTTOM OF CURB ELEVATION AS PER OPSD 600.110
8. EXISTING ESSEX POWER HYDRO POLE AND GUY ANCHOR IN PROPOSED DRIVE THRU AREA TO BE REMOVED/RELOCATED BY OTHERS.
9. CONTRACTOR TO MATCH TO EXISTING GRADES AT PROPERTY LIMITS AND AT DRIVEWAY ENTRANCES.



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No.	ISSUED FOR	DATE	BY
01	ISSUED FOR REVIEW	APRIL 2022	DB

DESIGN: DB	REVIEWED BY: JJ
DRAWN: DB	CHECKED BY: GT
DATE: APRIL 2022	
SCALE: 1:200	

131 & 135 SANDWICH STREET SOUTH DEVELOPMENT
TOWN OF AMHERSTBURG

PROJECT NO. 223783

CIVIL
FUNCTIONAL GRADING PLAN

SHEET NO. GR

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PLOT DATE: 2022-04-08 @ 8:44:08 AM PLOT SCALE: 1:25.4 PLOT STYLE: DILLON-STANDARD.CTB

DILLON CONSULTING LIMITED 130 DUFFERIN AVENUE, LONDON, ONTARIO, N6A 5R2, PHONE (519) 438-6192, FAX (519) 672-8209

Appendix B

Sanitary Sewer and Storm Sewer Design Sheets

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PROJECT NAME HERE
SANITARY SEWER DESIGN SHEET

Project Name: 131 & 135 Sandwich St. S. Devel
Project No: 22-3783
City / Municipality of Amherstburg

The Peaking Factor was derived:
Using Harmon Formula= Y (Y or N)
From a Table= N
Value from table=

Residential Average Daily Flow= 450 L/Cap.D
Peak Extraneous Flow= 0.200 L/Ha.S

Outlet Invert Elevation= 176.570
Mannings 'n'= 0.013
Total Area= 0.200

Basement Floor Elevation =
or
Hydraulic Grade Line Cover =

Ground Elevation at Outlet = 179.480
HGL at Outlet =

Location			Flow Characteristics								Sewer Design/Profile										Cover			Hydraulic Grade Line		
ROAD/STN	LOCATION		INDIVIDUAL		CUMULATIVE		PEAKING	POP FLOW	PEAK EXTR.	PEAK DESIGN	CAPACITY	LENGTH	PIPE DIA.	Wall	SLOPE	UPPER	LOWER	FALL	VELOCITY	DROP IN LOWER	Ground Elevation	Cover @ Up MH	Cover @ Low MH	HGL Elev	HGL Elev vs.	HGL Elev vs.
	FROM MH	TO MH	POP	AREA (ha.)	POP	AREA (ha.)	FACTOR M	Q(p) (L/s)	FLOW Q(i) (L/s)	FLOW Q(d) (L/s)	(L/s)	(m)	(mm)	Thickness (mm)	(%)	INVERT (m)	INVERT (m)	(m)	(m/s)	MANHOLE (m)	Upper MH	(m)	(m)	at Upstream MH	Grnd Elev @ Up MH	Obvert @ Up MH
Building	A	B	15.0	0.20	15	0.20	4.396	0.343	0.040	**0.38**	**56.81**	21.8	200	6	3.00	177.596	176.942	0.654	1.81	0.030	179.590	1.788	2.642	0.000		INTERSECTS OBVERT
Control MH	B	ex	0.0	0.00	15	0.20	4.396	0.343	0.040	**0.38**	**56.81**	11.4	200	6	3.00	176.912	176.570	0.342	1.81		179.790	2.672	2.704	0.000		INTERSECTS OBVERT

131 & 135 Sandwich St. S. Devel
STORM SEWER DESIGN SHEET

Project Name: 131 & 135 Sandwich St. S. Devel
Project Number: 22-3783

Intensity Option # 1

1) Intensity (i) = a/(t+b)^c **2) Intensity (i) = a*t^b** **3) Insert Intensity**

Based on 1:5 Year Storm Event
Location/Municipality of Amherstburg

a= 1680.869 **a=** **i=**
b= 9.828 **b=**
c= 0.883

Manning's n = 0.013

Total Area (ha)= 0.20000002 Outlet Invert Elevation= 175.605 Ground Elevation @ Outlet = 179.48 High Water Level at Outlet=

Location			Sewer Design / Profile																Cover			Hydraulic Grade Line	
Road /Stations	From MH	To MH	Area (ha)	Run. Coef.	2.78AC	Accum. 2.78AC	T of In (min)	T of F (min)	T of Conc. (min)	Intensity (mm/hr)	Exp. Flow (L/s)	Capacity (L/s)	Velocity (m/s)	Wall Thickness (mm)	Length (m)	Pipe Dia. (mm)	Slope (%)	Invert Up MH	Invert Low MH	Fall (m)	Drop Across Low MH (m)	Ground Elev Up MH	Cover @ Up MH (m)	Cover @ Low MH (m)	HGL Elevation at Upstream MH	HGL Elev vs. Grnd Elev @ Up MH
Parking	A	B	0.15	0.84	0.35	0.35	15.0	0.37	15.00	98.58	**34.53**	**68.38**	0.97	9	21.2	300	0.50	176.185	176.079	0.11	0.030	179.500	3.01	3.32	176.49	Okay
Drive Thru	B	C	0.05	0.84	0.12	0.47	15.0	0.37	15.37	97.32	**45.45**	**68.38**	0.97	9	21.5	300	0.50	176.049	175.942	0.11	0.060	179.710	3.35	3.34	176.35	Okay
OGS	C	D	0.00	0.84	0.00	0.47		0.13	15.74	96.07	**44.87**	**96.70**	1.37	9	10.7	300	1.00	175.882	175.775	0.11	0.080	179.590	3.40	3.58	176.18	Okay
Control MH	D	EX	0.00	0.84	0.00	0.47		0.06	15.87	95.64	**44.67**	**199.91**	1.81	11	6.9	375	1.30	175.695	175.605	0.09		179.660	3.58	3.49	176.07	Okay

Appendix C

Stormwater Management Calculations

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DILLON CONSULTING	Stormwater Management Calculations	Project:	131/135 Sandwich Street South, Amherstburg	No.:	22-3783
	Rational Method Calculations	By:	DB	Date:	2022-04-08
		Checked:	GT	Scenario:	Post100yr - Pre5yr

* with 1.25 multiplier

Catchment ID =	SITE	
Starting Time Step (t) =	15	Minutes
Time Step (t_1) =	1	Minutes
100YR Runoff Coefficient (C) =	0.95	
Catchment Area (A) =	0.185	ha

Land use	Area (ha)	C
Controlled	0.185	0.95
Uncontrolled	0.02	0.2
TOTAL	**0.20**	**0.90**

Peak Outflow ($Q_{allow; controlled}$)	0.035	(m^3/s)
Storage Required	**48.2**	m^3
Critical Duration	19	min

WE Standards 100 Year IDF Parameters		
A	B	C
2375	11	0.861

Storm Duration		Intensity	Peak Flow	Volume of Runoff	Release Flow Volume	Required Storage
$t = t_c + t_1$ (min.)	t (hr)	$I=a/(t_c+b)^c$ (mm/hr)	$Q=2.78CIA$ (m^3/s)	$Q * t$ (m^3)	$Q_o * t$ (m^3)	$Q - Q_o$ (m^3)
15	0.25	180	0.09	79.0	31.7	47.2
16	0.27	174	0.08	81.5	33.8	47.7
17	0.28	168	0.08	84.0	36.0	48.0
18	0.30	163	0.08	86.3	38.1	48.2
19	0.32	159	0.08	88.4	40.2	48.2
20	0.33	154	0.08	90.5	42.3	48.2
21	0.35	150	0.07	92.5	44.4	48.0
22	0.37	146	0.07	94.3	46.5	47.8
23	0.38	143	0.07	96.1	48.6	47.5
24	0.40	139	0.07	97.8	50.8	47.1
25	0.42	136	0.07	99.5	52.9	46.6
26	0.43	133	0.06	101.0	55.0	46.0
27	0.45	130	0.06	102.5	57.1	45.4
28	0.47	127	0.06	104.0	59.2	44.7
29	0.48	124	0.06	105.4	61.3	44.0
30	0.50	121	0.06	106.7	63.5	43.2
31	0.52	119	0.06	108.0	65.6	42.4
32	0.53	116	0.06	109.2	67.7	41.6
33	0.55	114	0.06	110.5	69.8	40.6
34	0.57	112	0.05	111.6	71.9	39.7

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Appendix D

Watermain Calculations

DILLON CONSULTING

Daei Foods inc
Watermain Design

Project Number: 22-3783
Date: April 4, 2022
Revised:
Design By: Mina Yacoub, P.Eng.
File: 22-3783 WM DESIGN

DILLON CONSULTING

CALCULATION SHEET

Boundary Conditions

HGL= p / γ + h

Pressure=	427.5	kPa	
	62.0	psi	Static Pressure from Hydrant Flow Test at Hydrant accross the Development

Peak Water Demand for the Units

Q= 3 x 26 gpm= 78 gpm — 26 gpm Peak Flow for Harvey' Restaurant
Assumed equal peak flow for all 3 units

Head Losses - Hazen-Williams Equation

$V = 0.85CR^{0.63}S^{0.54}$

$Q_{required}$=	4.92	L/s
	0.005	m^3/s
Pipe Diameter, D=	100	mm
	0.1	m
Area, A=	0.008	m^2
Velocity, V=	0.627	m/s
Hydraulic Radius, R=	0.025	m
H-W Coefficient, C=	100	
Slope energy grade line, S=	0.008	m/m
	0.082	kPa/m
Length of Pipe, L=	75	m
Friction $H_{f\ Pipe}$=	0.62	m
	6.12	kPa

Daei Foods inc
Watermain Design

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Revised:
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DILLON CONSULTING

CALCULATION SHEET

Head loss. $H_{f\ Minor}$= $K(\frac{v^2}{2g})$ where K =

0.45	45º Bend
0.75	90º Bend
2.00	Tee
0.20	Gate Valve open

Total # 90º Bends = 1
Head $H_{f\ 90º\ Bends}$= 0.02 m
0.15 kPa

Total # Tees = 1
Head $H_{f\ tees}$= 0.04 m
0.39 kPa

Total # Gate Valves = 1
Head $H_{f\ Gate\ Valves}$= 0.00 m
0.00 kPa

Total Losses

	kPa	psi
Friction Head Losses	6.1	0.9
Minor Head Losses	0.5	0.1
Total Head Losses	6.7	1.0

Minimum Flow Pressure at Building

P= 420.8 kPa
61.0 psi

WATER FLOW TEST REPORT

HYDRANT # & LOCATION: 131/135 Sandwich Street Amherstburg, ON

DATE: 3/31/22

TEST BY: Wallace Kent Sprinkler Systems

Day or Week: Thursday

TIME OF DAY: 2:00pm

MIN. OF FLOW: 5

WATER SUPPLIED BY: Municipal Water Supply

PURPOSE OF TEST: Testing Fire Hydrant

DATA

FLOW HYDRANT(S)	A1	A2	A3
SIZE OPENING:	2.5		
COEFFICIENT:	0.9		
PITOT READING:	30		
GPM:	**919**	0	0

TOTAL FLOW DURING TEST: **919** GPM

STATIC READING: 62 PSI

RESIDUAL: 60 PSI

RESULTS: AT 20 PSI RESIDUAL **4757** GPM

AT 0 PSI **5870** GPM

ESTIMATED CONSUMPTION: **4595** GAL.

REMARKS: