CLEARFORD
WATER SYSTEMS INC.

West Capital Airpark
City of Ottawa, Ontario

Phase 2 Business Park Development
SBS® Sanitary Collection Design Brief

Prepared for City of Ottawa

November 2024

Water Managed.

www.clearford.com

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SBS® Sanitary Collection System

Design Brief

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Brief Prepared By:

Clearford Water System Inc.
Suite 300, 1545 Carling Ave.
Ottawa, Ontario
K1Z 8P9

Tel – (613) 599-6474
Fax – (613) 599-7478

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APPENDICES

1.0 INTRODUCTION

Clearford Water Systems Inc. has been retained to complete a sanitary servicing design brief for the implementation of the Small Bore Sewer (SBS®) sanitary collection system for Phase 2 business park development within the West Capital Airpark (WCA) development in Ottawa, Ontario.

The WCA development comprises a mixed-use community with both residential and commercial areas. The residential sanitary servicing, utilizing SBS® collection system, has been approved under Environmental Compliance Approval No. 0961-A9UHS8 (Appendix B). The sanitary SBS® system is a small diameter gravity sewer (SDGS) system with variable gradient, as outlined in Section 5.15.4 of the MOE Design Guidelines for Sewage Works (2008).

This Design Brief has been prepared to satisfy the requirements of the Phase 2 business park development. Descriptions are provided for the design parameters, installation, operation and maintenance of the proposed sanitary collection system.

2.0 SITE DESCRIPTION

2.1 General Site Information

The WCA development is located on a 400-acre private property in the west end of the City of Ottawa. This site is bounded by agricultural land to the northwest, Diamondview Road on the southwest, Carp Road on the northeast, and aggregate pits to the southeast. The residential development site lies southwest of the existing airport facilities; the business park development is to the northeast of the facilities and adjacent to Carp Road.

2.2 Existing and Proposed Development

Currently, the approved residential phases on the southwest side of Thomas Argue Road consist of 342 residential lots and 2 equivalent residential units allocated for a future City Park.

The existing Phase 1 business park lots on Russ Bradly Road and Huisson Road are serviced by onsite subsurface sewage disposal systems.

The proposed Phase 2 business park development spans approximately 30 hectares in undeveloped land covered with grass and vegetations. The site is situated adjacent to the existing Phase 1 business park lots and the airport facilities with direct accesses off Thomas Argue Road to the west and Carp Road to the east. A small creek crosses the site from south to north.

There are no municipal services currently present at the site. However, a privately owned and operated wastewater treatment plant is less than 2.0 km in distance within the Airpark community, and adjacent to the residential development area.

3.0 3.0 SANITARY COLLECTION SYSTEM

Refer to Appendix A for a plan view and schematic of the sanitary sewer collection system for the proposed Phase 2 business park development.

3.1 Proposed SBS® Collection System Description

The proposed sanitary SBS® collection system for WCA Phase 2 business park is classified as a SDGS system with variable gradient according to MOE Design Guidelines for Sewage Works (2008). The system is comprised of at-source clarification with the liquid effluent transported by gravity through small diameter service laterals and sanitary mains (100 - 200 mm diameter) to an effluent pumping station, which lifts effluent to the existing wastewater treatment facility.

Interceptor tanks will be installed on each lot and will be privately owned, operated and maintained. The interceptor tanks provide at-source separation of sewage waste solids, fats, oils and greases (FOGs), and allow for storage and digestion of the accumulated sludge. Additionally, the clarification process reduces peak flows through attenuation in the system and provides pre-treatment of the domestic wastewater through reduction of the biological oxygen demand (BOD) and total suspended solids (TSS).

The small diameter sanitary laterals and mains, which collect tank effluent from each lot, will be constructed from high-density polyethylene (HDPE). To provide a watertight collection system, pipe fusion/welding technologies will be used to join the HDPE pipes and fittings. In addition, the system cleanouts, referred to system access points (SAPs), will replace the requirements for maintenance holes. SAPs will be installed to allow for monitoring, maintenance and periodic flushing of the system. All components of the SBS® collection system will be tested after installation to ensure a watertight system.

3.2 SBS® Collection System Design

Domestic sewage from commercial lots will be connected to interceptor tanks, where settable solids in the sewage will be captured in the tank after a minimum of 72 hours retention time. The liquid tank effluent will drain through service laterals to the SBS® mains in the road right-of-way.

Two (2) sanitary collection areas have been proposed for the new development. Sanitary effluent from the northwest side will flow by gravity to a proposed sewage pumping station near the corner of Street 15 and Servicing Block 24 (stormwater management pond). An inverted siphon will be used to transport effluent from the southeast side to the same pumping station. From there, the sanitary sewer will be lifted through a twin forcemain to the existing wastewater treatment plant located at the intersection of Wingover Private and Thomas Argue Road for further treatment. The treated final effluent is discharged via pipe outfall to an onsite dry ditch approximately 30 m from the treatment facility.

3.2.1 Design Parameters

The current assumptions for the new development applications include typical users of large warehouse/storage areas, office buildings, and potential users such as restaurants and hotels with a capacity up to 200 hotel rooms. Water demand was initially reviewed by Novatech Engineering and is estimated at 200,000 L/day on the maximum day (with a peaking factor of

1.5). Sanitary generation is directly correlated to water usage and is assumed to be approximately equal to the water demand.

The assumptions and design parameters used for sizing and hydraulic design of the proposed SBS® Collection System are presented in Table 3.1.

Table 3.1: Summary of Phase 2 Business Park SBS® Design Parameters

Parameter	Design Value	Reference
Commercial employee ADF Generation	75 L/employee/day	OBC Table 8.2.1.3.B
Office staff ADF Generation	75 L/staff/day	OBC Table 8.2.1.3.B
Restaurant ADF Generation	125 L/seat/day	OBC Table 8.2.1.3.B
Hotel room ADF Generation[a]	250 L/room/day	OBC Table 8.2.1.3.A
Peaking Factor[b]	2.0	MOE NETE Certificate
Inflow/Infiltration[b]	0 L/cap/day	MOE NETE Certificate
Sanitary SBS® Lateral Diameter	100 mm	MOE Sewage Works (2008)
Sanitary SBS® Main Diameter[b]	150 mm – 200 mm	
Manning's Roughness for HDPE DR17	0.013	MOE Sewage Works (2008)
Minimum Cleansing Velocity	0.15m/s	MOE NETE Certificate
Minimum Slope	0.20%	MOE NETE Certificate
Cleanout Max. Spacing	90 m	MOE NETE Certificate
Minimum Burial Depth for Mains	2.20 m	Frost protection purpose
Minimum Burial Depth for Interceptors	0.30 m	Manufacturer's guide
Interceptor Min. Hydraulic Retention Time	3 days	OBC Section 8.2.2.3.

Notes:
[a] Based on the water demand assumption provided by Novatech Engieering.
[b] Refer to Appendix C: *Ontario MOE – NETE Certificate* has an approved peaking factor of 2 and I/I=0.

The sewage generation rates for Phase 2 Business Park are summarized in Table 3.2, based on the water demand estimates for six (6) development scenarios provided by Novatech Engineering in Appendix D.

Table 3.2: Wastewater Generation for Six (6) Scenarios

Scenario	Development Type	Development Area (ha)	Generation Rate	Design Average Flow, Q_A (L/d)	Peak Flow (L/s)
1	20 employees/ha	32.0	75 L/employee/d	48,000	1.11
2	30 employees/ha	32.0	75 L/employee/d	72,000	1.67
3	40 employees/ha	32.0	75 L/employee/d	96,000	2.22
4	20 employees/ha	31.0	75 L/employee/d	46,500	1.08
	200-room hotel	1.0	250 L/guest/d	50,000	1.16
5	20 employees/ha	32.0	75 L/employee/d	48,000	1.11
	50-seat restaurant	-	125 L/seat/d	6,250	0.14
6	20 employees/ha	24.0	75 L/employee/d	36,000	0.83
	50-seat restaurant	-	125 L/seat/d	6,250	0.14
	800 office workers	8.0	75 L/guest/d	60,000	1.39

3.2.2 Interceptor Tanks

The interceptor tanks are designed to perform at-source solids separation, clarification, solids retention and primary treatment. The sizing of interceptor tanks will be determined in future during the detailed lot servicing design based on the specific development type and occupancy requirements of each commercial lot.

The volume of sludge production is expected to vary significantly from lot to lot, depending on the specific development type and occupancy requirements. Collection and storage of solids occurs year-round, with the contents of the tanks to be pumped out and disposed off-site by a licensed hauler.

3.2.3 Sanitary SBS® Mains, Laterals and SAPs

The sanitary SBS® mains for the Phase 2 business park are sized between 150 and 200 mm in diameter. The sanitary SBS® laterals connecting the interceptor tank outlets to the sanitary SBS® mains will have a diameter of 100 mm. Each segment of pipe has been analyzed using the Manning's Equation and a peaking factor of two, to account for the attenuation of peak flow that occurs in the interceptor tanks. Each sanitary collection main has been designed to carry the peak flow with a half-full pipe condition as an additional safety factor.

Sanitary sewer design calculations for the six (6) development scenarios are included in the Design Sheets in Appendix E. Based on the available information and hydraulic assessment of an evenly distributed flow patten throughout tributary areas of Phase 2 business park, it appears that the proposed SBS® mains have sufficient capacity to accommodate the new development and additional future connections to the system.

System access points (SAPs) are designed to allow for routine maintenance, monitoring and periodic flushing. SAPs will be installed at the start of each pipe run and throughout the sewer main network with a maximum separation distance of 90 metres.

Venting of the SBS® pipe network is critical to maintaining flow in the system and eliminating the potential for "air lock" conditions. Venting is passively achieved through headspace in the laterals, interceptor tanks, and plumbing vent stacks for each residential connection; additionally, air breather caps will be installed on SAPs for increased venting of the system.

3.2.4 Inverted Siphon – Creek Crossing

The inverted siphon for the creek crossing along Street 19 has been designed to eliminate the need for an additional pumping station. It will consist of two (2) barrels, each sized at 100 mm in diameter. Access to the inverted siphon inlet and outlet will be provided through the installation of maintenance holes at the respective locations, in accordance with MOE Design Guidelines for Sewage Works (2008).

During normal operation, the 150 mm incoming sewer will be modified to direct flow into one of the 100 mm diameter inlet barrels. The first 100 mm diameter siphon barrel will have the capacity to handle design average daily flow for the new development and additional future connections. The second 100 mm barrel will come into operation should the first 100 mm diameter barrel not be able to convey instantaneous design peak flows in the system. The maximum velocity through both barrels is estimated to be 0.57 m/s when flowing full, which will help reduce the settling potential of fine particles. This two-barrel system has a total sewage carrying capacity of 8.94 L/s. Thus, the double barrel system will allow for greater flexibility in

operation, and maintenance holes will provide access for routine inspection and for flushing and cleaning as required.

Flow capacity and velocities associated with each main of the inverted siphon are summarized in Table 3.3.

Table 3.3: Summary of Flows through Inverted Siphon Mains

Inverted Siphon Invert Elevations		Flow Capacity Siphon Mains		Full Flow Velocity in Siphon Mains	
Inlet (m)	Outlet (m)	1st 100mm Ø Barrel (L/s)	2nd 100mm Ø Barrel (L/s)	1st 100mm Ø Barrel (m/s)	2nd 100mm Ø Barrel (m/s)
101.79	101.04	4.47	4.47	0.57	0.57

3.2.5 Effluent Pumping Station and Forcemain Design

The effluent pumping station and force main for Phase 2 business park will be designed by others under separate cover.

3.3 Installation of SBS® System

3.3.1 Commercial Building Drainage Connections

Grease interceptors or other pre-treatment facilities are recommended for applicable individual commercial lots per the Ontario Building Code. These should be properly sized and located upstream of the SBS interceptor tanks to adequately capture excessive inorganic solids, fats, oils and grease prior to wastewater entering the SBS system. Pre-treatment facilities are the responsibility of the owner to operate and maintain.

It is also recommended to install approved backflow prevention devices such as backwater sanitary (“check”) valves upstream of the interceptor tanks to mitigate the risk of sewage backing up into the building facilities.

3.3.2 Interceptor Tanks

The installation of interceptor tanks will vary depending on the type of tank material, soil conditions, and groundwater levels. Installation requirements may involve rock removal, preparation of the bedding material, placement of the tank, backfilling and compaction, connection of inlet and outlet plumbing, and installation of access hatches. These requirements will be assessed on a case-by-case basis once the specific development type and occupancy requirements are determined for each commercial lot.

3.3.3 Sanitary SBS® Mains, Laterals and SAPs

SBS® laterals, mains and SAPs will be constructed from HDPE DR17 pipe, and all connections are made through butt fusion or electro-fusion couplings, creating a permanent weld of equal or greater strength than the pipe itself.

The sewer mains will be constructed within the road right-of-way with minimum cover of 2.20 metres from the edge of the road to crown of the sewer. Sanitary laterals will be constructed to provide the most direct connection to the sewer main. Thermal insulation of pipe

sections with less than 2.2m burial depth will be provided as per city of Ottawa Standard Details W21 and W22 for frost protection.

SAPs will be housed in a cast iron enclosure complete with cover to protect the internal HDPE riser. The risers will be fitted with HDPE friction caps with breather holes to ensure system venting and prevent infiltration and debris from entering.

3.3.4 Inverted Siphon – Creek Crossing

The inverted siphon barrels are to be installed by either horizontal directional drilling (HDD) technologies or by open trench. Manholes for access to the start and end of the inverted sewer barrels are to be installed as per OPSS 407.

3.3.5 CCTV Camera Inspection and Pressure Testing

Sewer main flushing should occur initially upon installation, followed by CCTV camera inspection. All components of the SBS® collection system will be tested in accordance with OPSS 409, 410 and 441 to ensure a watertight system. Low pressure air testing will be performed in accordance with OPSS 410.07.16.04.03, with no pressure drop. Sewer pipe segments where minimum 0.5m of clear vertical distance cannot be maintained in field to cross above watermains shall be pressure tested in accordance with Division 441 of the OPSS at a pressure of 350 kPa, with no leakage.

3.4 Operation and Maintenance

Maintenance requirements for the SBS® system are minimal, consisting of routine annual inspection and monitoring, as well as specific maintenance requirements for system components outlined in the following subsections. An operations and maintenance manual will be developed to document as-built information and to provide greater detail with respect to standard operations and maintenance requirements.

3.4.1 Interceptor Tanks

Sludge removal from residential interceptor tanks will be required depending on the specific development type and occupancy requirements of each commercial lot. Access hatches on the interceptor tanks allow for routine inspection, pumping, and other maintenance activities. Sludge removal will be performed by a licensed septage hauler and disposed at an approved facility.

3.4.2 Sanitary SBS® Mains, Laterals and SAPs

Typical cleaning intervals for cleaning sewer mains and laterals range from 7 to 10 years. SAPs provide access to the collection system for inspection and cleaning. System flushing or pressure washing is performed using potable water delivered through fire hoses or through equipment from a commercial sewer maintenance company.

3.4.3 Inverted Siphon

Inlet and outlet maintenance holes associated with the inverted siphon should be periodically inspected to ensure proper operation and that fine sediments are being flushed through the system. It is recommended to conduct a follow-up CCTV inspection of the siphon barrels every 7 to 10 years to better determine the maintenance plan, combining flushing and pressure washing requirements.

4.0 SUMMARY

The SBS® collection system has been designed for the proposed Phase 2 business park development. The SBS® collection system components are summarized as follows:

Interceptor Tanks

- Tanks will be installed for each commercial lot. The minimum working capacity of each tank will be determined when the specific development type and occupancy requirements are available.
- Tanks will be installed at a minimum 1.5 m setback from buildings and a minimum 300 mm soil cover on top with access hatches from grade level.
- Tanks will provide a minimum hydraulic retention time of 3 days.

SBS® Collection System

- A total of approximately 25 SBS® laterals, all 100 mm diameter HDPE DR17 pipe at minimum 0.5% slope, will connect interceptor tanks to the sewer mains.
- An approximately 2,450 m of new SBS® mains in 150mm and 200mm diameters HDPE DR17 will convey wastewater of the proposed development by gravity at minimum 0.20% slope to a proposed sewage pumping station.
- A total of 31 SAPs will be installed in the proposed SBS® mains with a maximum separation distance of 90 m.
- HDPE fusion/welding technologies to be used for all connections.

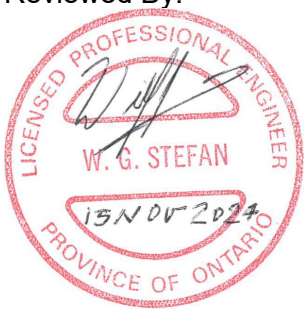
Operation and Maintenance Recommendations

- Routine monitoring of interceptor tanks and SBS® sewer collection system.
- Pump-out sludge from tanks when sludge level reaches 65% of liquid level.
- Routine inspection of inverted siphon structure and flushing or pressure washing at intervals of 7-10 years.
- SBS® system flushing or pressure washing at intervals of 7-10 years.
- Partial CCTV inspection after 5-10 years of operation to develop maintenance program based on observed conditions.

Prepared By:

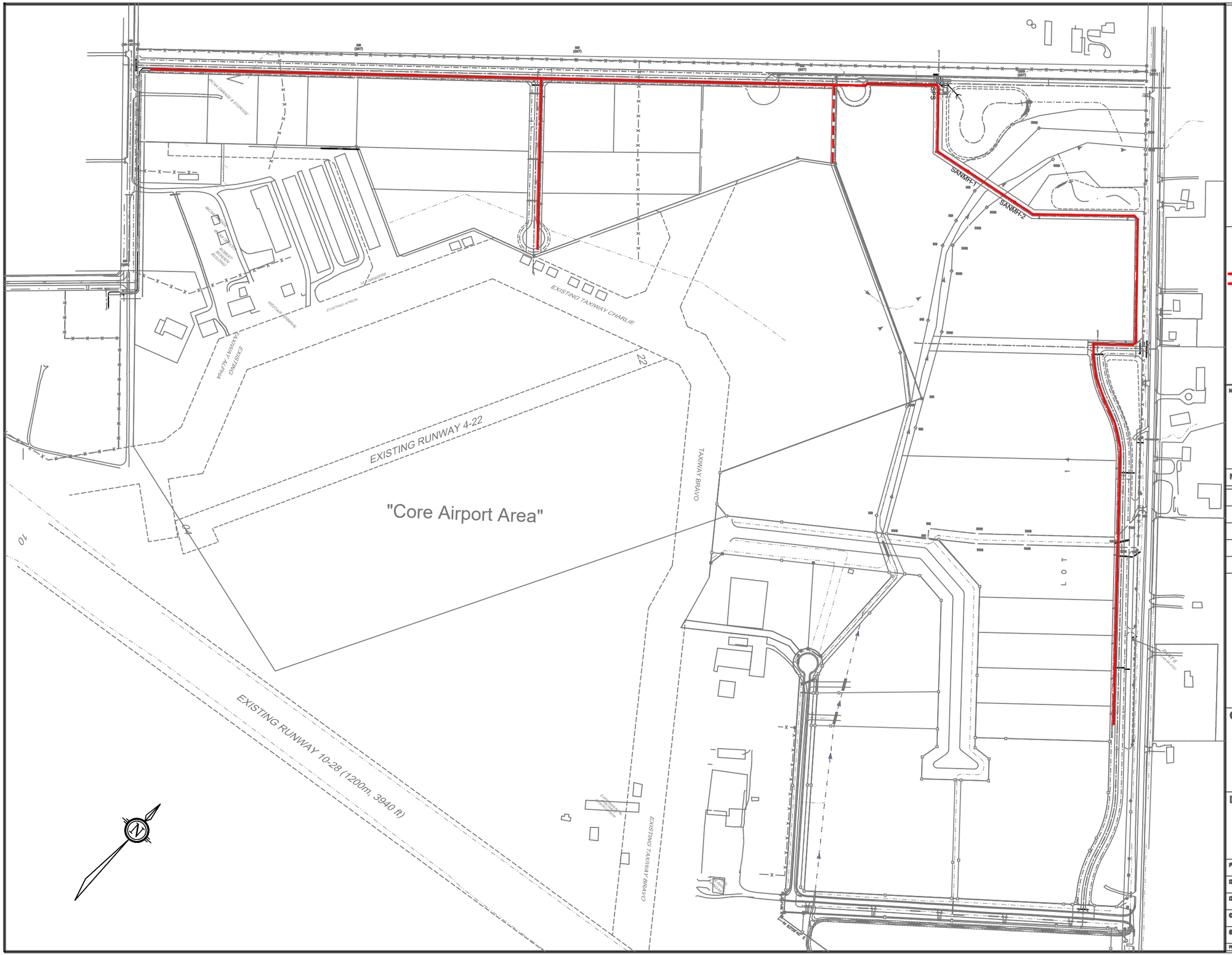
Yuxin Wang, EIT
Project Manager

Reviewed By:



Wilf Stefan, P.Eng.
COO

Appendix A: Plan View and Schematic of Proposed SBS® Collection System



NOTES

LEGEND

PROPOSED PHASE 2 SBS^{TM} MAIN

FUTURE PHASE SBS^{TM} MAIN

NOT VALID UNTIL SIGNED AND DATED

NO.	REVISIONS	DATE	INITAL
01	ISSUED FOR REVIEW	SEP 2024	PR
02	ISSUED FOR CHANGES	OCT 2024	YW

CLEARFORD™
Water Managed.™
1545 Carling Ave, Suite 300
Ottawa, Ontario, K1Z 8P9
Tel: (613) 599-6474 Fax: (613) 599-7478
www.clearford.com

CLIENT

WEST CAPITAL DEVELOPMENTS
CITY OF OTTAWA

DRAWING TITLE

PHASE 2 BUSINESS PARK
SAN SBS^{TM} COLLECTION SYSTEM

PROJECT No. 99001	DATE: 25-10-2024	CONTRACT No.	
DESIGNED BY: YW			
DRAWN BY: YW		DRAWING No.	
CHECKED BY: WB		APPENDIX A	
SCALE: NTS			

FILE PATH: P:\EPATH

Appendix B: Ontario MECC – ENVIORNMENTAL COMPLIANCE APPROVAL

Content Copy Of Original

Ontario

Ministry of the Environment and Climate Change
Ministère de l'Environnement et de l'Action en matière de changement climatique

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 0961-A9UHS8
Issue Date: February 10, 2017

1514947 Ontario Inc.
1500 Thomas Argue Rd
Carp, Ontario
K0A 1L0

Site Location: Carp Airport Subdivision
1500 Thomas Argue Road
City of Ottawa
K0A 1L0

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act , R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

construction of private sewage treatment facilities for the collection, transmission, treatment and discharge of treated effluent to a dry ditch (which discharges to Carp Creek eventually to Carp River), designed at a Rated Capacity of 372,000 Litres per day and a maximum daily flow of 744,000 Litres per day, together with stormwater management facilities to serve the Phase I and Phase 2 residential development and business park at the West Capital Airpark located at the Carp Airport, in the City of Ottawa, consisting of the following:

Septic Tanks

● installation of clarifier tanks, each having a minimum volume of 4,000 L capacity complete with inlet and outlet hatches, hydraulic mixer and flow attenuator located on each residential lot and the communal hangar site, 9,000 L capacity for the wastewater treatment system/City park location, and a 45,000 L capacity tank for the community center site, discharging to the sanitary collection system, identified below;

Sewage Collection System

● a small diameter gravity sewer system (Small Bore Sewer (SBS) by Clearford Water Systems or equivalent **)** , approximately 3,690 m in total length of collection mains with diameters ranging from 75 mm to 200 mm on the following streets:
- Albert Boyd Private, 400 m;
- Silver Dart Private 10 m;
- Sopwith Private 360 m;
- Wingover Private 985 m;
- Easements 550 m;
- Chandelle Private 670 m;
- Tailslide Private 415 m;
- TaxiwayE 300 m,

all complete with SAP type cleanouts;

● an inverted syphon, consisting of two (2) 100 mm diameter pipes, approximately 145 m in length , and one (1) 250 mm diameter sanitary sewer, approximately 30.7 m in length from the Wastewater Treatment Plant (described below), all discharging to the sanitary lift station, described below.

● one (1) 200mm diameter sanitary sewer, approximately 16.7m in length from the pump building, discharging to the equalization tanks located at the Wastewater Treatment Plan (described below);

Sanitary Lift Station

● a sanitary lift station, to convey sewage flows to the equalization tanks located at the wastewater treatment plant, and consisting of:

- one (1) wet well with a minimum operating volume of approximately 1,840 L;
- two (2) submersible pumps (one standby), each pump rated at 7.66 L/s at 6 m TDH, complete with a high liquid level alarm, and discharging via a 75 mm diameter forcemain to a 200 mm diameter sanitary sewer, approximately 21.6 m in length, discharging to the equalization tanks at the Wastewater Treatment Plant (described below);
- one (1) covered control panel.

Wastewater Treatment Plant

A modular package type wastewater treatment system rated at an average daily flow of 186 m^3/day for Phase 1 of the development and an additional average daily flow of 186 m 3 /day for Phase 2 of the development (progressing to average daily flow of 910 m^3/day at full build-out in Phase 5 in future), consisting of the following:

Phase 1

● an equalization tank system (multiple tanks) with a volume of 103 m^3 for Phase 1 of the development (309 m^3 at full build-out in Phase 5 in future), complete with an ultrasonic level transmitter to control pump operation and back-up high level alarm float switch.
● two rotary lobe blowers for aeration of the equalization tank system, as required.
● two variable speed pumps (one duty and one standby) to transfer wastewater through the screening system.
● two rotary brush screens (one duty and one standby) with 2 mm openings, each with a capacity of approximately 983 L/min, equipped with water level sensor and two feed forwards pumps (one duty and one standby).
● an aerobic tank with a storage volume of approximately 41 m^3, equipped with two rotary lobe blowers (one duty and one standby) for fine bubble aeration, complete with dissolved oxygen and pH transmitters, and chemical metering pumps to feed sodium hydroxide for pH adjustment (as needed) and alum to promote flocculation of suspended solids (as needed).
● a tank level transmitter and high level float alarm switch in aerobic tank as well as two centrifugal submersible feed pumps (one duty and one standby) rated at 12 L/s at 4.6 m TDH to pump wastewater to the membrane bioreactor.
● a membrane reactor system consisting of one membrane tank (approximate volume of 11.4 m^3) and two flat sheet membrane modules (newterra MB3-2 MicroClear) equipped with two permeate extraction pumps (one duty and one standby), complete with an overflow return line to the aerobic tank.
● two blowers (one duty and one standby) within the membrane reactor system for scouring of the membrane modules.
● a sludge holding tank having an approximate volume of 7 m^3 complete with a sludge dewatering system with mixing tank for polymer addition and dewatering press equipped with water return line to

the equalization tank, with dried sludge stored in an outdoor bin.
● an effluent flow meter prior to effluent discharge to an onsite dry ditch via a 200mm diameter sanitary sewer, approximately 31.7m in length.

Phase 2

· a second equalization tank with a volume of 103 m 3 for Phase 2 of the development.
· an aerobic tank with a storage volume of approximately 41 m^3, equipped with two rotary lobe blowers (one duty and one standby) for fine bubble aeration, complete with dissolved oxygen and pH transmitters, and chemical metering pumps to feed sodium hydroxide for pH adjustment (as needed) and alum to promote flocculation of suspended solids (as needed).
· a tank level transmitter and high level float alarm switch in aerobic tank as well as two centrifugal submersible feed pumps (one duty and one standby) rated at 12 L/s at 4.6 m TDH to pump wastewater to the membrane bioreactor.
· a membrane reactor system consisting of one membrane tank (approximate volume of 11.4 m^3) and two flat sheet membrane modules (newterra MB3-2 MicroClear) equipped with two permeate extraction pumps (one duty and one standby), complete with an overflow return line to the aerobic tank.
· two blowers (one duty and one standby) within the membrane reactor system for scouring of the membrane modules.

Stomwater Management Facilities

Construction of stormwater management works related to the construction of the Wastewater Treatment and Water Storage Facility at the West Capital Airpark located at the Carp Airport, in the City of Ottawa, to provide on-site stormwater quality protection and erosion control and to attenuate post-development peak flows to pre-development release rates for all storm events up to and including the 100-year storm event for a catchment area of 0.489 hectares of industrial area, discharging to the roadside ditch along Wingover Private and ultimately discharging to Carp Creek, consisting of the following:

● enhanced grassed swales, located along the east, south and west property boundaries (180m total) designed to convey runoff from storms up to and including the 100-year return period, with a trapezoidal cross-section, bottom slope of approximately 0.50%, bottom width of 0.75 metres, and 3:1 side slopes, discharging to two ditch inlet catch basins (DICB A and B);

● stormwater management facility (catchment area 0.489 hectares): Two (2) dry swales (WSW and ESW), located along the east, south and west property boundaries, each having a total storage volume of 27.90 m^3 and 27.14 m^3 respectively at a depth of 0.30 m, with side slopes of 3H:1V (maximum) and a bottom slope of approximately 0.5%, complete with two inlet control structures (DICB A and DICB B), receiving inflow from enhanced grassed swales; two multi-staged outlet control structures, Tempest 115mm orifice (installed in outlet pipe of DICB A) controlling flows to 17.9 L/s and a Tempest 90mm orifice (installed din the outlet pipe of DICB B) controlling flows to 11.1 L/s during the 100-year event, connecting to a riprap lined swale, discharging to the Wingover Private roadside ditch and ultimately discharging to Carp Creek;

● including erosion/ sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works,

all other controls, electrical equipment, instrumentation, piping, pumps, valves and appurtenances essential for the proper operation of the aforementioned sewage works;

all in accordance with the submitted supporting documents listed in **Schedule B.**

Appendix C: Ontario MOE – NETE Certificate

TECHNOLOGY ASSESSMENT • TECHNOLOGY ASSESSMENT

CERTIFICATE

OF TECHNOLOGY ASSESSMENT

Clearford Small Bore Sewer ™ System

The Ontario Ministry of the Environment has reviewed the **Clearford Small Bore Sewer ™ System** ***(SBS™)****. Based on a review of the data and the information submitted in support of the technology (see Notable Aspects and Appendix) the ministry concurs that the system, if applied according to design criteria subject to site specific considerations, can be a viable sewage collection and pre-treatment system suitable for application under Ontario conditions in accordance with MOE Design Guidelines for Sewage Works, 2008.*

Municipal applications of this technology in Ontario have already received site specific approval and historical performance data has shown agreement with the recommended general design criteria. Installation and operation of the ***SBS™*** *system requires individual Municipal or Provincial approval on a site specific basis, as applicable.*

Dale Henry

Dale Henry, Director

Standards Development Branch
Ontario Ministry of the Environment
(July 2009)

New Environmental Technology Evaluation Program

Promoting the development and application of new environmental technologies

Ontario

TECHNOLOGY ASSESSMENT • TECHNOLOGY ASSESSMENT

Clearford Small Bore Sewer ™ System

Notable Aspects of the Technology:

√ The Clearford Small Bore Sewer™ (SBS™) system is distinctly different from the traditional gravity sewers and has the following recommended key design criteria:

- √ Average daily flowrate of 200 to 225 litres per capita per day [L/(c·d)].
- √ Minimum design cleansing velocity of 0.15 m/s.
- √ Minimum nominal pipe diameter of 75 mm.
- √ Design zero infiltration flow.
- √ Design peaking factor of 2.

√ The SBS™ system utilizes an on-site SBS™ Clarifier which provides solids separation, solids storage and associated anaerobic digestion treatment. The effluent from the SBS™ Clarifier flows by gravity to the small diameter gravity sewers (SDGS) pipe network. The SDGS convey effluent from an interceptor tank or SBS™ Clarifier, to pumping station(s) or sewage treatment facility. These SDGS systems convey only clarified effluent (significant lower solids) and thus require smaller diameter pipes and reduced slopes (or can follow the surface contour of the land) reducing the amount of excavation and construction costs.

√ The SBS™ Clarifier consists of a vacuum tested two-chamber tank, with adjustable access for clean-out. The primary compartment comprises 80% of the total Clarifier tank volume which provides for increased solids storage and digestion. Clarifier tanks are installed to service each household, block of homes or commercial establishments. The recommended pump-out maintenance cycle is up to 10 years for an average density household. At this pump-out frequency there is approximately a 50% reduction in sludge volume due to anaerobic digestion. Proper disposal of collected septage from SBS™ Clarifiers must be performed by licensed septage haulers, with local authorities enforcing powers for hygiene control.

√ The SBS™ Clarifier is vented in two directions: the receiving compartment vents back through the house/building plumbing stack and the discharge end vents forward through the collection system by a combination of building stacks, earth (subsurface) venting and through installed air vents within the pipe network.

√ The SBS™ collection system consists of fused-joint high density polyethylene (HDPE) piping for its collection mains, laterals and clean-out access points. Ventilation on-site and throughout the collection system at critical junctures is required to enable flow with a minimum gradient. The SBS™ collection system is not alignment sensitive but requires that the overall net gradient is positive if a minimum slope of 0.15% is met. The SBS™ collection system has a recommended flushing cycle every 7 to 10 years through the use of strategically designed clean-outs/flush points, called

system access points (SAP), which follows the Clarifier pump-out schedule. The SBS™ collection system, with the use of HDPE materials, permits the utilization of trenchless technology for installing mains and laterals. Air release vents are required at or slightly downstream of summits in sewer profiles. Since all sanitary sewers generate some odours at various points in the system, the pipe network of the SBS™ collection system that conveys Clarifier effluent has odour control installed at all access points where necessary. Generally, odour control is effectively managed by the use of subsurface venting, well designed drop inlets and other control measures.

√ The SBS™ collection system uses fused-joint high density polyethylene (HDPE) pipes in accordance with manufacturers' recommendations and installation specifications. Pipes must be buried deep enough to prevent damage from anticipated earth and vehicle loading and below the frost line to prevent freezing.

√ The general design criteria for the Small Bore Sewer™ system include:

1) Per capita average daily sewage flow range of 200 to 225 L/(c·d), plus zero infiltration allowance, with the use of fused-joint HDPE collection system and the use of water-tight, vacuum tested SBS™ Clarifier with sealed inlet and outlet components.

2) A minimum cleansing velocity of 0.15 m/s is recommended.

3) Whenever possible, it is desirable to use actual flow data for design purposes, however in the absence of flow data a peak hour design factor of 2 is recommended.

4) Each segment of sewer is analysed by the Hazen-Williams or Manning equations to determine if the pipe is adequately sized and sloped to conduct the peak design flow.

5) Typical municipal SBS™ Clarifier effluent characteristics for BOD_5, TSS, TKN and TP are 120, 40, 30 and 6 mg/L, respectively, based on typical removal rates. There is no record of the SBS™ system clogging.

6) The SBS™ collection system pipes must be buried deep enough to prevent damage from anticipated earth and vehicle loading and below the frost line to prevent freezing.

7) The SBS™ collection system is comprised of the following components: the HDPE pipe, which has a 90 year design-life, is connected via thermal fusion methodologies to the concrete Clarifier tank, which has a 35+ year design-life. All components are corrosion resistant. Discharges to gravity sewer interceptors or treatment facilities will typically be made through drop inlets below the liquid level to minimize odours.

8) Mainline clean-outs are generally spaced up to 250 metres apart. Unlike maintenance holes, clean-outs are not required at every change in alignment or elevation. Clean-outs are sealed and do not

allow for inflow, unlike maintenance holes.

9) Primary clarification is not generally required to treat Clarifier tank liquid effluent and direct discharge to secondary treatment systems is generally appropriate. All currently available treatment systems, such as sand filters, aerobic treatment system, and membrane based treatment systems, are generally effective in downstream treatment of SBS™ effluent; treatment technology selection is generally subject to site specific discharge parameters' consideration. Generally odour control at the headwork of a sewage treatment plant should receive attention.

√ Many SDGS systems using similar principles of design to the Small Bore Sewer™ system have been installed in Australia and the United States since the 1960s and 1970s respectively. The SBS™ system provides improvements to the traditional SDGS systems by the use of horizontal drilling installation techniques, improved materials and advancements in quality control measures.

√ The Small Bore Sewer™ system has been approved for construction in Ontario, in the Township of Cramahe in 2003, in the Village of Wardsville in 2000 and in Field Township in 1989; subsequent systems have been installed in Alberta, British Columbia and Ontario. The construction of the sewage works was approved by the MOE Environmental Assessment and Approvals Branch (EAAB) under the Ontario Water Resources Act (OWRA).

In the Village of Wardsville (part of the Municipality of Southwest Middlesex)

√ The approved Small Bore Sewer™ system serves 151 single family homes, a golf course, nursing home and other municipal establishments with on-site SBS™ Clarifiers ranging in size from 3600 to 45,000 litres.

√ The collection system consists of about 4,500 metres of 75 mm diameter HDPE pipes and larger diameter pipes. Performance data from 2001 to 2005 on the Small Bore Sewer™ system provides confirmation that the most stringent recommended general design criteria have been met.

√ Field examination of 29 residential two-chamber septic tanks with 3600 L volume, serving 2.0 adults per site on average, had been in operation for approximately 7 years without septage removal and the following has been reported:

1) An average 1st chamber sludge plus scum volume of 110 L/yr.
2) An average 2nd chamber sludge plus scum volume of 14 L/yr.
3) Average pump out period for the first chamber based on 30% sludge tank volume is 10 ± 7 years.
4) The average chemical concentrations of the sludge in the 1st chamber were calculated and reported to be:
   TS = 49 ± 18 g/L;
   BOD_5 = 5760 ± 4000 mg/L;
   TKN = 1025 ± 73 mg/L; and,
   pH = 6.7 ± 0.3.

√ Based on a 6 month monitoring program from February to August 2008 of the Wardsville Pumping Station, the following sewage generation rates were reported:

1) Average daily flow of 157 L/c/d (weekdays) with a 1.8 peaking factor.
2) Average daily flow of 142 L/c/d (weekends) with a 1.8 peaking factor.
3) These sewage generation rates reflect the use of fused HDPE pipes and the lack of manholes and lateral connections which reduce infiltration and inflow (I/I)

√ Reduced I/I and resulting lower sewage generation rates, as reported, may eliminate bypass occurrences or reduce downstream wastewater treatment plant upgrades or expansions.

In the Township of Field

√ The approved Small Bore Sewer™ system was installed in the Township of Field in 1989 to serve 35 single family homes and other municipal establishments with on-site SBS™ Clarifiers of 2,700 to 4,600 litres, serving a total of 117 equivalent population. An average design value of 225 L/(c·d) with a peaking factor of 2 was used and a minimum HDPE pipe size of 75 mm diameter was adopted. Three pumping stations were required and each used 50 mm diameter HDPE forcemains.

√ At the Field installation the frost penetration was investigated and a minimum design depth of 1.1 metre for pipe burial was adopted with provision for 50 mm jacket insulation and heat tracing in well travelled bare road sections. Shallower and narrower pipe trenches were used as compared to conventional sanitary sewers.

√ The actual per capita sewage flows once infiltration/inflow sources had been eliminated ranged from 90 to 130 L/(c·d). Some odour issues developed and were resolved by the proper use of drop inlets, soil odour filters and a cover at the sewage treatment plant.

√ Performance and evaluation reports in 1993 and 1995 on the performance of the Small Bore Sewer™ system in the Township of Field indicated that the recommended General Design Criteria were met during the evaluation period.

√ Both Field and Wardsville used extended aeration treatment plants without primary clarification to treat the SBS™ effluent.

√ Operation at new sites requires a Certificate of Approval (C of A) under the Ontario Water Resources Act (OWRA). However, the C of A is not required under Section 53(6)(b) of the OWRA when the SBS™ system is used on private property and connects to a municipal sewer.

APPENDIX

Documents reviewed:

1. PowerPoint presentation dated May 2006.

2. "Clearford Industries Inc. Wastewater Systems Division", PCL National Partner, promotional brochure.

3. Letter from EAAB on Certificate of Approval No. 3-0013-96-PE dated July 22, 1996, signed by Mirek Tybinkowski.

4. Certificate of Approval for The Corporation of the Village of Wardsville, No. 4608-4FNLG6 dated January 24, 2000.

5. Cover of MOE publication entitled, "An Introduction to Communal Sewage Systems" with reference to "grade sewers".

6. A 46 page design report entitled, "TAG Technical Note No. 14, The Design of Small Bore Sewer Systems" by R. Ottis and D. D. Mars, Technical Advisory Group (TAG).

7. National Small Flows Clearinghouse, Pipeline, Fall 1996, Vol. 7, No. 4.

8. Article from "The Ontario Technologist", Trenchless Technology: Working Underground Without Going Underground by Bill Garibaldi, CET, September/October, 1997.

9. National Small Flows Clearinghouse, Pipeline, Fall 2000, Vol. 11, No. 4.

10. Small Flows Quarterly, Spring 2001, Vol. 2, No. 2.

11. "Decentralized Systems Technology Fact Sheet, Small Diameter Gravity Sewers", by the U.S. EPA Agency, Office of Water, Washington D.C., EPA 832-F-00-38, September, 2000.

12. Technical paper entitled, "A comparison of sewer reticulation system design standards gravity, vacuum and small bore sewers", by C. J. Little, first presented at the 2004 Water Institute of South Africa (WISA) Biennial Conference, Cape Town, South Africa, 2-6 May 2004.

13. Two page summary on the Township of Field, Small Diameter Effluent Sewers full scale installation of 35 residences, a recreational facility and a municipal garage.

14. Eight page summary report entitled, "Small Diameter Effluent Sewers, Summary Report, Experiences at Township of Field", by C. W. Brink, P. Eng., Engineering Resources, 1995.

15. Eighteen page report entitled, "Monitoring and Evaluation Report, Small Bore Sewers, Village of Field, Ontario", prepared for the MOE and CETEC North Committee, MOE project No. 3-0515, by R. W. Connelly Associates Inc., Consulting Engineers and Planners, Carp, Ontario, May 2003.

16. Article in Municipal World, June 2004 by Jim Williams entitled, "Small bore sewer solution preserves development opportunities for Cramahe Township".

17. Letter from C. W. Brink of OCWA dated June 24, 1994 identifying the cost benefits of SBS, need to control infiltration and integration of STP with collection system, based on Twp of Field experience located near North Bay, Ontario.

18. Two letters of endorsement of the SBS™ from the Village of Wardsville related to significant cost savings. The letters were from the village Reeve and Project Coordinator.

19. Three letters endorsing the SBS™ system by GE-Zenon, Seprotech and Waterloo Biofilter. These groups provide sewage treatment systems

Appendix D: Water Demand Scenarios

Novatech Project #: 102085
Project Name: Carp Airport - Phase 2 Business Park
Date: December 6, 2022
Revised: December 13, 2022
Revised: October 9, 2024
Revised: October 31, 2024

Water Allocation and Monitoring Framework
Water Demand Scenarios

Available Allocation from Village of Carp after short term upgrades by City		
	Max Day	**0.2 ML/day**
Average Day Based on 1.5 Max Day factor	0.1333	ML/day
Average Day Based on 1.5 Max Day factor	**133,333**	L/day

Total Net Development Area (approx)	32.0	ha
Prorated Average Day Allocation per hectare	4167	L/ha/day

	Estimated Design Demand						**Remaining Allocation**	
	Employee Based Demand [1]			**Other Demand**			**Average Day**	
	Area (ha)	**# of Employees**	**SubTotal (L/day)**	**Area (ha)**	**Unit [2] (L/day)**	**SubTotal (L/day)**	**Total (L/day)**	**% of Available**
Scenario 1 20 employees/ha	32.0	640	48,000				**85,333**	**64%**
Scenario 2 30 employees/ha	32.0	960	72,000				**61,333**	**46%**
Scenario 3 40 employees/ha	32.0	1,280	96,000				**37,333**	**28%**
Scenario 4 20 employees/ha 200 Room Hotel [3]	31.0	620	46,500	1.0	250	50,000	**36,833**	**28%**
Scenario 5 20 employees/ha 50 Restaurant Seats	32.0	640	48,000		125	6,250	**79,083**	**59%**
Scenario 6 20 employees/ha 50 Restaurant Seats 800 Office workers	24.0 8.0	480 75	36,000 60,000		125	6,250	**37,333**	**28%**

Notes:
[1] Assumes typical use having large warehouse/storage areas, low number of employees onsite and no process water.
[2] Unit Demand based on the following:
250 L/day per hotel room [3]
125 L/day per restaurant seat
75 L/day per employee
[3] Existing hotel room review: Sandman Airport 201 rooms, Brookstreet 276, Hilton downtown 175, Hilton Kanata 101
[4] Net Development Area is subject to confirmation of the Tributary setbacks and City approval of the revised Draft Plan.

Appendix E: SBS® Sanitary Sewer Design Sheet

06001-West Captial Airpark Business Park Development: Clearford SBS® Sanitary Sewer Design Sheet - Scenario 1

		Location								Cumulative						Sewer Parameters					Flow Design					
		1	2				3				4		5	6	7	8	9	10	11	12	13	14	15	16	17	20
Phase	Catchment Area	Location	From (Label)	From Chainage		From Proposed Grade	To (Label)	To Chainage		To Proposed Grade	Contributing Blocks	Catchment Area (m2)	Percentage (%)	Equivalent Employees	Cumulative Equivalent Employees	Peak Design Flow, Qp [L/s]	Pipe Length [m]	U/S Invert [m]	D/S Invert [m]	Proposed Sewer Slope [%]	Pipe Size, [mm]	Pipe Capacity Qf [L/s]	Capacity Ratio Qp/Qf	Velocity Ratio Vp/Vf	Full Flow Velocity [m/s]	Peak Design Velocity [m/s]	Comments/Areas
Phase 2 - Business Park	A	Street 15	SAP	15+	37.202	111.12		15+	125.000	111.39	BLK 1	8,535.076	2.82%	18.04	18.04	0.031	87.80	108.88	108.62	0.30%	147	7.90	0.00	0.00	0.47	0.00	Start of run
	A	Street 15		15+	125.000	111.39		15+	175.000	111.19	BLK 2	6,390.598	2.11%	13.51	31.54	0.055	50.00	108.62	108.45	0.33%	147	8.33	0.01	0.00	0.49	0.00	
	A	Street 15		15+	175.000	111.19		15+	250.000	110.89	BLK 3	6,359.889	2.10%	13.44	44.98	0.078	75.00	108.45	108.15	0.40%	147	9.13	0.01	0.00	0.54	0.00	
	A	Street 15		15+	250.000	110.89		15+	325.000	110.59	BLK 4	6,364.207	2.10%	13.45	58.43	0.101	75.00	108.15	107.85	0.40%	147	9.13	0.01	0.25	0.54	0.14	
	A	Street 15		15+	325.000	110.59		15+	550.000	109.69	BLK 5	22,607.763	7.47%	47.78	106.21	0.184	225.00	107.85	106.95	0.40%	147	9.13	0.02	0.33	0.54	0.18	
	B	Street 16	SAP	76+	241.992	110.47		76+	200.000	110.57	-	-	-	-	-	-	41.99	108.11	107.90	0.52%	147	10.41	-	-	-	-	
	B	Street 16		76+	200.000	110.57		76+	150.000	110.33	BLK 7, 8	21,664.782	7.15%	45.78	45.78	0.079	50.00	107.90	107.64	0.52%	147	10.41	0.01	0.00	0.61	0.00	Start of run
	B	Street 16		76+	150.000	110.33		76+	100.000	110.08	BLK 6, 9	24,713.575	8.16%	52.23	98.01	0.170	50.00	107.64	107.37	0.52%	147	10.44	0.02	0.25	0.61	0.16	
	B	Street 16		76+	100.000	110.08		76+	9.137	109.58	-	0	0	0.00	98.01	0.170	90.86	107.37	106.92	0.51%	147	10.26	0.02	0.25	0.60	0.15	
								15+	569.557																		
	C	Street 15		15+	550.000	109.69		15+	569.557	109.61	-	0	0	0.00	106.21	0.184	19.56	106.95	106.88	0.39%	147	9.03	0.02	0.33	0.53	0.18	
	C	Street 15		15+	569.557	109.61		15+	575.000	109.59		0	0	0.00	204.22	0.355	5.44	106.88	106.85	0.43%	147	9.46	0.04	0.37	0.56	0.21	
	C	Street 15		15+	575.000	109.59		15+	675.000	109.19	BLK 10	8,902.465	2.94%	18.81	223.03	0.387	100.00	106.85	106.45	0.40%	147	9.13	0.04	0.40	0.54	0.22	
	C	Street 15		15+	675.000	109.19		15+	800.000	108.69	BLK 11	10,868.815	3.59%	22.97	246.00	0.427	125.00	106.45	105.95	0.40%	147	9.13	0.05	0.40	0.54	0.22	
	C	Street 15		15+	800.000	108.69		15+	969.189	107.76	BLK 12	20,614.462	6.81%	43.56	289.57	0.503	169.19	105.95	105.13	0.49%	147	10.09	0.05	0.40	0.59	0.24	
	C	Street 15		15+	969.189	107.76	Future Connection	15+	975.000	107.89	Future Phase			1,778	2,067.57	3.590	5.81	105.13	105.09	0.70%	192	24.62	0.15	0.59	0.85	0.50	
	C	Street 15		15+	975.000	107.89		16+	40.093	107.38	BLK 13	29,314.258	9.68%	61.95	2,129.52	3.697	65.09	105.09	104.55	0.83%	192	26.80	0.14	0.57	0.93	0.53	
	C	Street 15		16+	40.093	107.38	Elbow to SPS	16+	110.287	106.67	-	0	0	0.00	2,129.52	3.697	70.19	104.55	103.85	0.99%	192	29.27	0.13	0.56	1.01	0.57	
	D	Street 17	SAP	17+	283.160	109.72		17+	358.052	109.17	BLK 21,20	17,488.770	5.77%	36.96	36.96	0.064	74.89	107.59	106.84	1.00%	147	14.44	0.00	0.00	0.85	0.00	Start of run
	D	Street 17		17+	358.052	109.17		17+	477.639	108.94	BLK 19,18	17,497.693	5.78%	36.98	73.94	0.128	119.59	106.84	106.37	0.40%	147	9.13	0.01	0.25	0.54	0.14	
	D	Street 17		17+	477.639	108.94		17+	548.272	108.74	BLK 17	15,253.792	5.04%	32.24	106.17	0.184	70.63	106.37	105.96	0.57%	147	10.92	0.02	0.25	0.64	0.16	
	E	Street 17		17+	548.272	108.74		17+	659.939	107.75	BLK 16	28409.356	9.38%	60.04	166.21	0.289	111.67	105.96	105.40	0.50%	147	10.20	0.03	0.33	0.60	0.20	
	E	Street 17		17+	659.939	107.75		17+	694.810	107.58	-	0	0	0.00	166.21	0.289	34.87	105.40	105.15	0.73%	147	12.32	0.02	0.33	0.73	0.24	
	E	Street 17		17+	694.810	107.58		17+	726.161	107.27	-	0	0	0.00	166.21	0.289	31.35	105.15	104.84	0.98%	147	14.25	0.02	0.33	0.84	0.28	
	E	Street 17		17+	726.161	107.27		17+	762.460	106.90		0	0	0.00	166.21	0.289	36.30	104.84	104.47	1.03%	147	14.63	0.02	0.25	0.86	0.22	
	E	Street 17		17+	762.460	106.90		17+	789.081	106.61	BLK 15	32200.591	10.63%	68.05	234.26	0.407	26.62	104.47	104.19	1.04%	147	14.72	0.03	0.33	0.87	0.29	
	E	Street 17		17+	789.081	106.61	90° Elbow	17+	807.126	106.13	-	0	0	0.00	234.26	0.407	18.05	104.19	104.02	0.99%	147	14.35	0.03	0.33	0.85	0.28	
	E	Street 18	90° Elbow	17+	807.126	106.13	45° Elbow-1	18+	297.413	105.81	-	0	0	0.00	234.26	0.407	53.72	104.02	102.94	2.00%	147	20.42	0.02	0.25	1.20	0.30	
				18+	243.698	106.50																					
	E	Street 18	45° Elbow-1	18+	297.413	105.81	45° Elbow-2	18+	300.967	105.76	-	0	0	0.00	234.26	0.407	5.03	102.94	102.90	0.84%	147	13.19	0.03	0.37	0.78	0.29	
								19+	20.215		-																
	F	Street 19	45° Elbow-2	19+	20.215	105.27	45° Elbow-3	19+	187.830	105.27	BLK 14	25,659.231	8.47%	54.23	288.48	0.501	167.62	102.90	102.35	0.33%	147	8.29	0.06	0.46	0.49	0.22	
	F	Street 19	45° Elbow-3	19+	187.830	105.27	45° Elbow-4	19+	194.315	104.32		0	0	0.00	288.48	0.501	6.48	102.35	102.33	0.33%	147	8.29	0.06	0.46	0.49	0.22	
	F	Street 19	45° Elbow-4	19+	194.315	104.32		19+	275.000	104.71		0	0	0.00	288.48	0.501	80.69	102.33	102.06	0.33%	147	8.34	0.06	0.46	0.49	0.22	
	F	Street 19		19+	275.000	104.71	45° Elbow-5	19+	332.796	105.38		0	0	0.00	288.48	0.501	57.80	102.06	101.87	0.33%	147	8.26	0.06	0.46	0.49	0.22	
	F	Street 19		19+	332.796	105.38	Siphon MH-2	19+	355.774	105.32		0	0	0.00	288.48	0.501	22.98	101.87	101.79	0.33%	147	8.24	0.06	0.46	0.49	0.22	
	F	Street 19	Siphon MH-2	19+	355.774	105.32	Siphon MH-1	19+	457.535	106.00		0	0	0.00	288.48	0.501	101.76	101.79	101.04	0.75%	147	12.50	0.04	0.40	0.74	0.30	Inverted Siphon
	F	Street 19	Siphon MH-1	19+	457.535	106.00	45° Elbow-6	19+	488.329	106.18		0	0	0.00	288.48	0.501	30.79	101.04	100.94	0.33%	147	8.33	0.06	0.46	0.49	0.22	
	F	Street 19	45° Elbow-6	19+	488.329	106.18	SPS MH	19+	556.032	107.00		0	0	0.00	288.48	0.501	67.70	100.94	100.71	0.33%	147	8.29	0.06	0.46	0.49	0.22	

NOTES:

n = Manning's coefficient 0.013
q = Average daily per employee flow = 75 L/cap/d
q = Average daily per restaurant seat flow 125 L/cap/d
q = Average daily per hotel room flow = 250 L/cap/d
q = Average daily per office staff flow = 75 L/cap/d

I = Unit average extraneous flow (new) = 0.00
M = Peak Factor (Harmon) = $M = 1 + \frac{14}{4 + \sqrt{P}}$ where M_{MAX} = 4.5, M_{MIN} = 2.0
Min. pipe cover = 2.20

PROJECT: West Capital Airpark, Ottawa, Ontario
PROJECT No.: 06001
Date: May 6th, 2024
DESIGNED BY: Y.Wang
CHECKED BY: W.G.Stefan
REVISION DATE: June 17th, 2024; September 27th, 2024; November 15th, 2024

CLEARFORD WATER SYSTEMS INC.
300-1545 Carling Ave, Ottawa, ON K1Z 8P9
Tel: (613)599-6474, Fax: (613)599-7478

06001-West Captial Airpark Business Park Development: Clearford SBS® Sanitary Sewer Design Sheet - Scenario 2

		Location								Cumulative						Sewer Parameters					Flow Design					
		1	2				3				4		5	6	7	8	9	10	11	12	13	14	15	16	17	20
Phase	Drain Area	Location	From (Label)	From Chainage	From Proposed Grade	To (Label)	To Chainage	To Proposed Grade	Contributing Blocks	Catchment Area (m2)	Percentage (%)	Equivalent Employees	Cumulative Equivalent Employees	Peak Design Flow, Qp [L/s]	Pipe Length [m]	U/S Invert [m]	D/S Invert [m]	Proposed Sewer Slope [%]	Pipe Size, [mm]	Pipe Capacity Qf [L/s]	Capacity Ratio Qp/Qf	Velocity Ratio Vp/Vf	Full Flow Velocity [m/s]	Peak Design Velocity [m/s]	Comments/Areas
Phase 2 - Business Park	A	Street 15	SAP 1	15+ 37.202	111.12		15+ 125.000	111.39	BLK 1	8,535.076	2.82%	27.06	27.06	0.047	87.80	108.88	108.62	0.30%	147	7.904	0.01	0.00	0.47	0.00	Start of run
	A	Street 15		15+ 125.000	111.39		15+ 175.000	111.19	BLK 2	6,390.598	2.11%	20.26	47.31	0.082	50.00	108.62	108.45	0.33%	147	8.332	0.01	0.00	0.49	0.00	
	A	Street 15		15+ 175.000	111.19		15+ 250.000	110.89	BLK 3	6,359.889	2.10%	20.16	67.47	0.117	75.00	108.45	108.15	0.40%	147	9.125	0.01	0.25	0.54	0.14	
	A	Street 15		15+ 250.000	110.89		15+ 325.000	110.59	BLK 4	6,364.207	2.10%	20.17	87.65	0.152	75.00	108.15	107.85	0.40%	147	9.127	0.02	0.25	0.54	0.14	
	A	Street 15		15+ 325.000	110.59		15+ 550.000	109.69	BLK 5	22,607.763	7.47%	71.67	159.31	0.277	225.00	107.85	106.95	0.40%	147	9.126	0.03	0.37	0.54	0.20	
	B	Street 16	SAP	76+ 241.992	110.47		76+ 200.000	110.57	-	-	-	-	-	-	41.99	108.11	107.90	0.52%	147	10.410	-	-	-	-	
	B	Street 16	SAP 2	76+ 200.000	110.57		76+ 150.000	110.33	BLK 7, 8	21,664.782	7.15%	68.68	68.68	0.119	50.00	107.90	107.64	0.52%	147	10.410	0.01	0.25	0.61	0.15	Start of run
	B	Street 16		76+ 150.000	110.33		76+ 100.000	110.08	BLK 6, 9	24,713.575	8.16%	78.34	147.02	0.255	50.00	107.64	107.37	0.52%	147	10.436	0.02	0.33	0.61	0.20	
	B	Street 16		76+ 100.000	110.08		76+ 9.137	109.58	-	0	0	0.00	147.02	0.255	90.86	107.37	106.90	0.52%	147	10.452	0.02	0.33	0.62	0.20	
							15+ 569.557																		
	C	Street 15		15+ 550.000	109.69		15+ 569.557	109.61	-	0	0	0.00	159.31	0.277	19.56	106.95	106.88	0.39%	147	9.031	0.03	0.37	0.53	0.20	
	C	Street 15		15+ 569.557	109.61		15+ 575.000	109.59		0	0	0.00	306.33	0.532	5.44	106.88	106.85	0.43%	147	9.462	0.06	0.43	0.56	0.24	
	C	Street 15		15+ 575.000	109.59		15+ 675.000	109.19	BLK 10	8,902.465	2.94%	28.22	334.55	0.581	100.00	106.85	106.45	0.40%	147	9.127	0.06	0.46	0.54	0.25	
	C	Street 15		15+ 675.000	109.19		15+ 800.000	108.69	BLK 11	10,868.815	3.59%	34.45	369.00	0.641	125.00	106.45	105.95	0.40%	147	9.126	0.07	0.48	0.54	0.26	
	C	Street 15		15+ 800.000	108.69		15+ 969.189	107.76	BLK 12	20,614.462	6.81%	65.35	434.35	0.754	169.19	105.95	105.13	0.49%	147	10.095	0.07	0.48	0.59	0.29	
	C	Street 15		15+ 969.189	107.76	Future Connection	15+ 975.000	107.89	Future Phase			1,778	2212.35	3.841	5.81	105.13	105.09	0.70%	192	24.618	0.16	0.60	0.85	0.51	
	C	Street 15		15+ 975.000	107.89		16+ 40.093	107.38	BLK 13	29,314.258	9.68%	92.92	527.27	0.915	65.09	105.09	104.55	0.83%	192	26.804	0.03	0.37	0.93	0.34	
	C	Street 15		16+ 40.093	107.38	Elbow to SPS	16+ 110.287	106.67	-	0	0	0.00	527.27	0.915	70.19	104.55	103.85	0.99%	192	29.266	0.03	0.37	1.01	0.38	
	D	Street 17	SAP 17A	17+ 283.160	109.72		17+ 358.052	109.17	BLK 21,20	17,488.770	5.77%	55.44	55.44	0.096	74.89	107.59	106.84	1.00%	147	14.437	0.01	0.00	0.85	0.00	Start of run
	D	Street 17		17+ 358.052	109.17		17+ 477.639	108.94	BLK 19,18	17,497.693	5.78%	55.47	110.90	0.193	119.59	106.84	106.37	0.40%	147	9.126	0.02	0.33	0.54	0.18	
	D	Street 17		17+ 477.639	108.94		17+ 548.272	108.74	BLK 17	15,253.792	5.04%	48.35	159.26	0.276	70.63	106.37	105.96	0.57%	147	10.916	0.03	0.33	0.64	0.21	
	E	Street 17		17+ 548.272	108.74		17+ 659.939	107.75	BLK 16	28409.356	9.38%	90.06	249.31	0.433	111.67	105.96	105.40	0.50%	147	10.196	0.04	0.40	0.60	0.24	
	E	Street 17		17+ 659.939	107.75		17+ 694.810	107.58	-	0	0	0.00	249.31	0.433	34.87	105.40	105.15	0.73%	147	12.321	0.04	0.37	0.73	0.27	
	E	Street 17		17+ 694.810	107.58		17+ 726.161	107.27	-	0	0	0.00	249.31	0.433	31.35	105.15	104.84	0.98%	147	14.252	0.03	0.37	0.84	0.31	
	E	Street 17		17+ 726.161	107.27		17+ 762.460	106.90		0	0	0.00	249.31	0.433	36.30	104.84	104.47	1.03%	147	14.626	0.03	0.33	0.86	0.29	
	E	Street 17		17+ 762.460	106.90		17+ 789.081	106.61	BLK 15	32200.591	10.63%	102.07	351.39	0.610	26.62	104.47	104.19	1.04%	147	14.723	0.04	0.40	0.87	0.35	
	E	Street 17		17+ 789.081	106.61	90° Elbow	17+ 807.126	106.13	-	0	0	0.00	351.39	0.610	18.05	104.19	104.02	0.99%	147	14.352	0.04	0.40	0.85	0.34	
	E	Street 18	90° Elbow	17+ 807.126	106.13	45° Elbow-1	18+ 297.413	105.81	-	0	0	0.00	351.39	0.610	53.72	104.02	102.94	2.00%	147	20.418	0.03	0.33	1.20	0.40	
				18+ 243.698	106.50																				
	E	Street 18	45° Elbow-1	18+ 297.413	105.81	45° Elbow-2	18+ 300.967	105.76	-	0	0	0.00	351.39	0.610	5.03	102.94	102.90	0.84%	147	13.190	0.05	0.40	0.78	0.31	
							19+ 20.215		-																
	F	Street 19	45° Elbow-2	19+ 20.215	105.27	45° Elbow-3	19+ 187.830	105.27	BLK 14	25,659.231	8.47%	81.34	432.73	0.751	167.62	102.90	102.35	0.33%	147	8.289	0.09	0.51	0.49	0.25	
									-																
	F	Street 19	45° Elbow-3	19+ 187.830	105.27	45° Elbow-4	19+ 194.315	104.32		0	0	0.00	432.73	0.751	6.48	102.35	102.33	0.33%	147	8.290	0.09	0.51	0.49	0.25	
	F	Street 19	45° Elbow-4	19+ 194.315	104.32		19+ 275.000	104.71		0	0	0.00	432.73	0.751	80.69	102.33	102.06	0.33%	147	8.337	0.09	0.51	0.49	0.25	
	F	Street 19		19+ 275.000	104.71	45° Elbow-5	19+ 332.796	105.38		0	0	0.00	432.73	0.751	57.80	102.06	101.87	0.33%	147	8.258	0.09	0.51	0.49	0.25	
	F	Street 19		19+ 332.796	105.38	Siphon MH-2	19+ 355.774	105.32		0	0	0.00	432.73	0.751	22.98	101.87	101.79	0.33%	147	8.244	0.09	0.51	0.49	0.25	
	F	Street 19	Siphon MH-2	19+ 355.774	105.32	Siphon MH-1	19+ 457.535	106.00		0	0	0.00	432.73	0.751	101.76	101.79	101.04	0.75%	147	12.497	0.06	0.46	0.74	0.34	Inverted Siphon
	F	Street 19	Siphon MH-1	19+ 457.535	106.00	45° Elbow-6	19+ 488.329	106.18		0	0	0.00	432.73	0.751	30.79	101.04	100.94	0.33%	147	8.326	0.09	0.51	0.49	0.25	
	F	Street 19	45° Elbow-6	19+ 488.329	106.18	SPS MH	19+ 556.032	107.00		0	0	0.00	432.73	0.751	67.70	100.94	100.71	0.33%	147	8.291	0.09	0.51	0.49	0.25	

NOTES:

n = Manning's coefficient 0.013

q = Average daily per employee flow = 75 L/cap/d

q = Average daily per restaurant seat flow 125 L/cap/d

q = Average daily per hotel room flow = 250 L/cap/d

q = Average daily per office staff flow = 75 L/cap/d

I = Unit average extraneous flow (new) = 0.00

M = Peak Factor (Harmon) = $M = 1 + \frac{14}{4 + \sqrt{P}}$ 2.00

where M_{MAX} = 4.5

M_{MIN} = 2.0

Min. pipe cover = 2.20

PROJECT: West Capital Airpark, Ottawa, Ontario

PROJECT No.: 06001

Date: May 6th, 2024

DESIGNED BY: Y.Wang

CHECKED BY: W.G.Stefan

REVISION DATE: June 17th, 2024; September 27th, 2024; November 15th, 2024

CLEARFORD WATER SYSTEMS INC.
300-1545 Carling Ave, Ottawa, ON K1Z 8P9
Tel: (613)599-6474, Fax: (613)599-7478

06001-West Captial Airpark Business Park Development: Clearford SBS® Sanitary Sewer Design Sheet - Scenario 3

		Location								Cumulative						Sewer Parameters					Flow Design					
		1	2				3				4		5	6	7	8	9	10	11	12	13	14	15	16	17	20
Phase	Drain Area	Location	From (Label)	From Chainage	From Proposed Grade	To (Label)	To Chainage	To Proposed Grade	Contributing Blocks	Catchment Area (m2)	Percentage (%)	Equivalent Employees	Cumulative Equivalent Employees	Peak Design Flow, Qp [L/s]	Pipe Length [m]	U/S Invert [m]	D/S Invert [m]	Proposed Sewer Slope [%]	Pipe Size, [mm]	Pipe Capacity Qf [L/s]	Capacity Ratio Qp/Qf	Velocity Ratio Vp/Vf	Full Flow Velocity [m/s]	Peak Design Velocity [m/s]	Comments/Areas
Phase 2 - Business Park	A	Street 15	SAP 1	15+ 37.202	111.12		15+ 125.000	111.39	BLK 1	8,535.076	2.82%	36.07	36.07	0.063	87.80	108.88	108.62	0.30%	147	7.904	0.01	0.00	0.47	0.00	Start of run
	A	Street 15		15+ 125.000	111.39		15+ 175.000	111.19	BLK 2	6,390.598	2.11%	27.01	63.08	0.110	50.00	108.62	108.45	0.33%	147	8.332	0.01	0.25	0.49	0.12	
	A	Street 15		15+ 175.000	111.19		15+ 250.000	110.89	BLK 3	6,359.889	2.10%	26.88	89.97	0.156	75.00	108.45	108.15	0.40%	147	9.125	0.02	0.25	0.54	0.14	
	A	Street 15		15+ 250.000	110.89		15+ 325.000	110.59	BLK 4	6,364.207	2.10%	26.90	116.86	0.203	75.00	108.15	107.85	0.40%	147	9.127	0.02	0.33	0.54	0.18	
	A	Street 15		15+ 325.000	110.59		15+ 550.000	109.69	BLK 5	22,607.763	7.47%	95.55	212.42	0.369	225.00	107.85	106.95	0.40%	147	9.126	0.04	0.40	0.54	0.22	
	B	Street 16	SAP	76+ 241.992	110.47		76+ 200.000	110.57	-	-	-	-	-	-	41.99	108.11	107.90	0.52%	147	10.410	-	-	-	-	
	B	Street 16	SAP 2	76+ 200.000	110.57		76+ 150.000	110.33	BLK 7, 8	21,664.782	7.15%	91.57	91.57	0.159	50.00	107.90	107.64	0.52%	147	10.410	0.02	0.25	0.61	0.15	Start of run
	B	Street 16		76+ 150.000	110.33		76+ 100.000	110.08	BLK 6, 9	24,713.575	8.16%	104.45	196.02	0.340	50.00	107.64	107.37	0.52%	147	10.436	0.03	0.37	0.61	0.23	
	B	Street 16		76+ 100.000	110.08		76+ 9.137	109.58	-	0	0	0.00	196.02	0.340	90.86	107.37	106.90	0.52%	147	10.452	0.03	0.37	0.62	0.23	
							15+ 569.557																		
	C	Street 15		15+ 550.000	109.69		15+ 569.557	109.61	-	0	0	0.00	212.42	0.369	19.56	106.95	106.88	0.39%	147	9.031	0.04	0.40	0.53	0.21	
	C	Street 15		15+ 569.557	109.61		15+ 575.000	109.59		0	0	0.00	408.44	0.709	5.44	106.88	106.85	0.43%	147	9.462	0.07	0.48	0.56	0.27	
	C	Street 15		15+ 575.000	109.59		15+ 675.000	109.19	BLK 10	8,902.465	2.94%	37.63	446.07	0.774	100.00	106.85	106.45	0.40%	147	9.127	0.08	0.49	0.54	0.26	
	C	Street 15		15+ 675.000	109.19		15+ 800.000	108.69	BLK 11	10,868.815	3.59%	45.94	492.00	0.854	125.00	106.45	105.95	0.40%	147	9.126	0.09	0.51	0.54	0.27	
	C	Street 15		15+ 800.000	108.69		15+ 969.189	107.76	BLK 12	20,614.462	6.81%	87.13	579.13	1.005	169.19	105.95	105.13	0.49%	147	10.095	0.10	0.51	0.59	0.30	
	C	Street 15		15+ 969.189	107.76	Future Connection	15+ 975.000	107.89	Future Phase			1,778	2,357.13	4.092	5.81	105.13	105.09	0.70%	192	24.515	0.17	0.61	0.85	0.52	
	C	Street 15		15+ 975.000	107.89		16+ 40.093	107.38	BLK 13	29,314.258	9.68%	123.90	2,481.03	4.307	65.09	105.09	104.55	0.83%	192	26.693	0.16	0.61	0.92	0.57	
	C	Street 15		16+ 40.093	107.38	Elbow to SPS	16+ 110.287	106.67	-	0	0	0.00	2,481.03	4.307	70.19	104.55	103.85	0.99%	192	29.144	0.15	0.59	1.01	0.59	
	D	Street 17	SAP 17A	17+ 283.160	109.72		17+ 358.052	109.17	BLK 21,20	17,488.770	5.77%	73.92	73.92	0.128	74.89	107.59	106.84	1.00%	147	14.437	0.01	0.00	0.85	0.00	Start of run
	D	Street 17		17+ 358.052	109.17		17+ 477.639	108.94	BLK 19,18	17,497.693	5.78%	73.96	147.87	0.257	119.59	106.84	106.37	0.40%	147	9.126	0.03	0.33	0.54	0.18	
	D	Street 17		17+ 477.639	108.94		17+ 548.272	108.74	BLK 17	15,253.792	5.04%	64.47	212.34	0.369	70.63	106.37	105.96	0.57%	147	10.916	0.03	0.37	0.64	0.24	
	E	Street 17		17+ 548.272	108.74		17+ 659.939	107.75	BLK 16	28409.356	9.38%	120.07	332.42	0.577	111.67	105.96	105.40	0.50%	147	10.196	0.06	0.43	0.60	0.26	
	E	Street 17		17+ 659.939	107.75		17+ 694.810	107.58	-	0	0	0.00	332.42	0.577	34.87	105.40	105.15	0.73%	147	12.321	0.05	0.40	0.73	0.29	
	E	Street 17		17+ 694.810	107.58		17+ 726.161	107.27	-	0	0	0.00	332.42	0.577	31.35	105.15	104.84	0.98%	147	14.252	0.04	0.40	0.84	0.34	
	E	Street 17		17+ 726.161	107.27		17+ 762.460	106.90		0	0	0.00	332.42	0.577	36.30	104.84	104.47	1.03%	147	14.626	0.04	0.37	0.86	0.32	
	E	Street 17		17+ 762.460	106.90		17+ 789.081	106.61	BLK 15	32200.591	10.63%	136.10	468.52	0.813	26.62	104.47	104.19	1.04%	147	14.723	0.06	0.43	0.87	0.37	
	E	Street 17		17+ 789.081	106.61	90° Elbow	17+ 807.126	106.13	-	0	0	0.00	468.52	0.813	18.05	104.19	104.02	0.99%	147	14.352	0.06	0.43	0.85	0.36	
	E	Street 18	90° Elbow	17+ 807.126	106.13	45° Elbow-1	18+ 297.413	105.81	-	0	0	0.00	468.52	0.813	53.72	104.02	102.94	2.00%	147	20.418	0.04	0.37	1.20	0.45	
				18+ 243.698	106.50																				
	E	Street 18	45° Elbow-1	18+ 297.413	105.81	45° Elbow-2	18+ 300.967	105.76	-	0	0	0.00	468.52	0.813	5.03	102.94	102.90	0.84%	147	13.190	0.06	0.46	0.78	0.36	
							19+ 20.215		-																
	F	Street 19	45° Elbow-2	19+ 20.215	105.27	45° Elbow-3	19+ 187.830	105.27	BLK 14	25,659.231	8.47%	108.45	576.97	1.002	167.62	102.90	102.35	0.33%	147	8.289	0.12	0.56	0.49	0.27	
									-																
	F	Street 19	45° Elbow-3	19+ 187.830	105.27	45° Elbow-4	19+ 194.315	104.32		0	0	0.00	576.97	1.002	6.48	102.35	102.33	0.33%	147	8.290	0.12	0.56	0.49	0.27	
	F	Street 19	45° Elbow-4	19+ 194.315	104.32		19+ 275.000	104.71		0	0	0.00	576.97	1.002	80.69	102.33	102.06	0.33%	147	8.337	0.12	0.56	0.49	0.27	
	F	Street 19		19+ 275.000	104.71	45° Elbow-5	19+ 332.796	105.38		0	0	0.00	576.97	1.002	57.80	102.06	101.87	0.33%	147	8.258	0.12	0.56	0.49	0.27	
	F	Street 19		19+ 332.796	105.38	Siphon MH-2	19+ 355.774	105.32		0	0	0.00	576.97	1.002	22.98	101.87	101.79	0.33%	147	8.244	0.12	0.56	0.49	0.27	
	F	Street 19	Siphon MH-2	19+ 355.774	105.32	Siphon MH-1	19+ 457.535	106.00		0	0	0.00	576.97	1.002	101.76	101.79	101.04	0.75%	147	12.497	0.08	0.49	0.74	0.36	
	F	Street 19	Siphon MH-1	19+ 457.535	106.00	45° Elbow-6	19+ 488.329	106.18		0	0	0.00	576.97	1.002	30.79	101.04	100.94	0.33%	147	8.326	0.12	0.56	0.49	0.27	
	F	Street 19	45° Elbow-6	19+ 488.329	106.18	SPS MH	19+ 556.032	107.00		0	0	0.00	576.97	1.002	67.70	100.94	100.71	0.33%	147	8.291	0.12	0.56	0.49	0.27	

NOTES:

n = Manning's coefficient 0.013

q = Average daily per employee flow = 75 L/cap/d

q = Average daily per restaurant seat flow 125 L/cap/d

q = Average daily per hotel room flow = 250 L/cap/d

q = Average daily per office staff flow = 75 L/cap/d

I = Unit average extraneous flow (new) = 0.00

M = Peak Factor (Harmon) = $M = 1 + \frac{14}{4 + \sqrt{P}}$ 2.00

where M_{MAX} = 4.5

M_{MIN} = 2.0

Min. pipe cover = 2.20

PROJECT: West Capital Airpark, Ottawa, Ontario

PROJECT No.: 06001

Date: May 6th, 2024

DESIGNED BY: Y.Wang

CHECKED BY: W.G.Stefan

REVISION DATE: June 17th, 2024; September 27th, 2024; November 15th, 2024

CLEARFORD WATER SYSTEMS INC.
300-1545 Carling Ave, Ottawa, ON K1Z 8P9
Tel: (613)599-6474, Fax: (613)599-7478

06001-West Captial Airpark Business Park Development: Clearford SBS® Sanitary Sewer Design Sheet - Scenario 4-A

		Location								Cumulative							Sewer Parameters						Flow Design					
		1	2				3				4		5	6		7	8	9	10	11	12	13	14	15	16	17	20
Phase	Drain Area	Location	From (Label)	From Chainage		From Proposed Grade	To (Label)	To Chainage		To Proposed Grade	Contributing Blocks	Catchment Area (m2)	Percentage (%)	Equivalent Employees	Cumulative Equivalent Employees	Commerical Hotel Rooms	Peak Design Flow, Qp [L/s]	Pipe Length [m]	U/S Invert [m]	D/S Invert [m]	Proposed Sewer Slope [%]	Pipe Size, [mm]	Pipe Capacity Qf [L/s]	Capacity Ratio Qp/Qf	Velocity Ratio Vp/Vf	Full Flow Velocity [m/s]	Peak Design Velocity [m/s]	Comments/Areas
Phase 2 - Business Park	A	Street 15	SAP 1	15+	37.202	111.12		15+	125.000	111.39	BLK 1	8,535.076	2.82%	17.47	17.47	200	1.188	87.80	108.88	108.62	0.30%	147	7.904	0.15	0.60	0.47	0.28	Start of run
	A	Street 15		15+	125.000	111.39		15+	175.000	111.19	BLK 2	6,390.598	2.11%	13.08	30.56		1.210	50.00	108.62	108.45	0.33%	147	8.332	0.15	0.59	0.49	0.29	
	A	Street 15		15+	175.000	111.19		15+	250.000	110.89	BLK 3	6,359.889	2.10%	13.02	43.58		1.233	75.00	108.45	108.15	0.40%	147	9.125	0.14	0.57	0.54	0.31	
	A	Street 15		15+	250.000	110.89		15+	325.000	110.59	BLK 4	6,364.207	2.10%	13.03	56.61		1.256	75.00	108.15	107.85	0.40%	147	9.127	0.14	0.57	0.54	0.31	
	A	Street 15		15+	325.000	110.59		15+	550.000	109.69	BLK 5	22,607.763	7.47%	46.28	102.89		1.336	225.00	107.85	106.95	0.40%	147	9.126	0.15	0.59	0.54	0.32	
	B	Street 16	SAP	76+	241.992	110.47		76+	200.000	110.57	-	-	-	-	-	-	-	41.99	108.11	107.90	0.52%	-	-	-	-	-	-	
	B	Street 16	SAP 2	76+	200.000	110.57		76+	150.000	110.33	BLK 7, 8	21,664.782	7.15%	44.35	44.35		1.234	50.00	107.90	107.64	0.52%	147	10.410	0.12	0.54	0.61	0.33	Start of run
	B	Street 16		76+	150.000	110.33		76+	100.000	110.08	BLK 6, 9	24,713.575	8.16%	50.59	94.95		1.322	50.00	107.64	107.37	0.52%	147	10.436	0.13	0.56	0.61	0.34	
	B	Street 16		76+	100.000	110.08		76+	9.137	109.58	-	0	0	0.00	94.95		1.322	90.86	107.37	106.90	0.52%	147	10.452	0.13	0.56	0.62	0.34	
								15+	569.557																			
	C	Street 15		15+	550.000	109.69		15+	569.557	109.61	-	0	0	0.00	102.89		1.336	19.56	106.95	106.88	0.39%	147	9.031	0.15	0.59	0.53	0.31	
	C	Street 15		15+	569.557	109.61		15+	575.000	109.59		0	0	0.00	197.84		1.501	5.44	106.88	106.85	0.43%	147	9.462	0.16	0.60	0.56	0.34	
	C	Street 15		15+	575.000	109.59		15+	675.000	109.19	BLK 10	8,902.465	2.94%	18.23	216.06		1.533	100.00	106.85	106.45	0.40%	147	9.127	0.17	0.61	0.54	0.33	
	C	Street 15		15+	675.000	109.19		15+	800.000	108.69	BLK 11	10,868.815	3.59%	22.25	238.31		1.571	125.00	106.45	105.95	0.40%	147	9.126	0.17	0.62	0.54	0.34	
	C	Street 15		15+	800.000	108.69		15+	969.189	107.76	BLK 12	20,614.462	6.81%	42.20	280.52		1.644	169.19	105.95	105.13	0.49%	147	10.095	0.16	0.61	0.59	0.37	
				15+	969.189	107.76	Future Connection	15+	975.000	107.89	Future Phase			1,778	2058.52		4.731	5.81	105.13	105.09	0.70%	192	24.618	0.19	0.64	0.85	0.55	
	C	Street 15		15+	975.000	107.89		16+	40.093	107.38	BLK 13	29,314.258	9.68%	60.01	2118.53		4.835	65.09	105.09	104.55	0.83%	192	26.804	0.18	0.63	0.93	0.58	
	C	Street 15		16+	40.093	107.38	Elbow to SPS	16+	110.287	106.67	-	0	0	0.00	2118.53		4.835	70.19	104.55	103.85	0.99%	192	29.266	0.17	0.61	1.01	0.62	
	D	Street 17	SAP 17A	17+	283.160	109.72		17+	358.052	109.17	BLK 21,20	17,488.770	5.77%	35.80	35.80		0.062	74.89	107.59	106.84	1.00%	147	14.437	0.00	0.00	0.85	0.00	Start of run
	D	Street 17		17+	358.052	109.17		17+	477.639	108.94	BLK 19,18	17,497.693	5.78%	35.82	71.63		0.124	119.59	106.84	106.37	0.40%	147	9.126	0.01	0.25	0.54	0.14	
	D	Street 17		17+	477.639	108.94		17+	548.272	108.74	BLK 17	15,253.792	5.04%	31.23	102.85		0.179	70.63	106.37	105.96	0.57%	147	10.916	0.02	0.25	0.64	0.16	
	E	Street 17		17+	548.272	108.74		17+	659.939	107.75	BLK 16	28409.356	9.38%	58.16	161.02		0.280	111.67	105.96	105.40	0.50%	147	10.196	0.03	0.33	0.60	0.20	
	E	Street 17		17+	659.939	107.75		17+	694.810	107.58	-	0	0	0.00	161.02		0.280	34.87	105.40	105.15	0.73%	147	12.321	0.02	0.33	0.73	0.24	
	E	Street 17		17+	694.810	107.58		17+	726.161	107.27	-	0	0	0.00	161.02		0.280	31.35	105.15	104.84	0.98%	147	14.252	0.02	0.25	0.84	0.21	
	E	Street 17		17+	726.161	107.27		17+	762.460	106.90		0	0	0.00	161.02		0.280	36.30	104.84	104.47	1.03%	147	14.626	0.02	0.25	0.86	0.22	
	E	Street 17		17+	762.460	106.90		17+	789.081	106.61	BLK 15	32200.591	10.63%	65.92	226.94		0.394	26.62	104.47	104.19	1.04%	147	14.723	0.03	0.33	0.87	0.29	
	E	Street 17		17+	789.081	106.61	90° Elbow	17+	807.126	106.13	-	0	0	0.00	226.94		0.394	18.05	104.19	104.02	0.99%	147	14.352	0.03	0.33	0.85	0.28	
	E	Street 18	90° Elbow	17+	807.126	106.13	45° Elbow-1	18+	297.413	105.81	-	0	0	0.00	226.94		0.394	53.72	104.02	102.94	2.00%	147	20.418	0.02	0.25	1.20	0.30	
				18+	243.698	106.50																						
	E	Street 18	45° Elbow-1	18+	297.413	105.81	45° Elbow-2	18+	300.967	105.76	-	0	0	0.00	226.94		0.394	5.03	102.94	102.90	0.84%	147	13.190	0.03	0.33	0.78	0.26	
								19+	20.215		-																	
	F	Street 19	45° Elbow-2	19+	20.215	105.27	45° Elbow-3	19+	187.830	105.27	BLK 14	25,659.231	8.47%	52.53	279.47		0.485	167.62	102.90	102.35	0.33%	147	8.289	0.06	0.43	0.49	0.21	
											-																	
	F	Street 19	45° Elbow-3	19+	187.830	105.27	45° Elbow-4	19+	194.315	104.32		0	0	0.00	279.47		0.485	6.48	102.35	102.33	0.33%	147	8.290	0.06	0.43	0.49	0.21	
	F	Street 19	45° Elbow-4	19+	194.315	104.32		19+	275.000	104.71		0	0	0.00	279.47		0.485	80.69	102.33	102.06	0.33%	147	8.337	0.06	0.43	0.49	0.21	
	F	Street 19		19+	275.000	104.71	45° Elbow-5	19+	332.796	105.38		0	0	0.00	279.47		0.485	57.80	102.06	101.87	0.33%	147	8.258	0.06	0.43	0.49	0.21	
	F	Street 19		19+	332.796	105.38	Siphon MH-2	19+	355.774	105.32		0	0	0.00	279.47		0.485	22.98	101.87	101.79	0.33%	147	8.244	0.06	0.43	0.49	0.21	
	F	Street 19	Siphon MH-2	19+	355.774	105.32	Siphon MH-1	19+	457.535	106.00		0	0	0.00	279.47		0.485	101.76	101.79	101.04	0.75%	147	12.497	0.04	0.37	0.74	0.27	Inverted Siphon
	F	Street 19	Siphon MH-1	19+	457.535	106.00	45° Elbow-6	19+	488.329	106.18		0	0	0.00	279.47		0.485	30.79	101.04	100.94	0.33%	147	8.326	0.06	0.43	0.49	0.21	
	F	Street 19	45° Elbow-6	19+	488.329	106.18	SPS MH	19+	556.032	107.00		0	0	0.00	279.47		0.485	67.70	100.94	100.71	0.33%	147	8.291	0.06	0.43	0.49	0.21	

NOTES:

n = Manning's coefficient 0.013

q = Average daily per employee flow = 75 L/cap/d

q = Average daily per restaurant seat flow = 125 L/cap/d

q = Average daily per hotel room flow = 250 L/cap/d

q = Average daily per office staff flow = 75 L/cap/d

I = Unit average extraneous flow (new) = 0.00

M = Peak Factor (Harmon) = 2.00

$$M = 1 + \frac{14}{4 + \sqrt{P}}$$ where M_{MAX} = 4.5, M_{MIN} = 2.0

Min. pipe cover = 2.20

PROJECT: West Capital Airpark, Ottawa, Ontario

DESIGNED BY: Y.Wang

REVISION DATE: June 17th, 2024; September 27th, 2024; November 15th, 2024

PROJECT No.: 06001

Date: May 6th, 2024

CHECKED BY: W.G.Stefan

CLEARFORD WATER SYSTEMS INC.
300-1545 Carling Ave, Ottawa, ON K1Z 8P9
Tel: (613)599-6474, Fax: (613)599-7478

06001-West Captial Airpark Business Park Development: Clearford SBS® Sanitary Sewer Design Sheet - Scenario 4-B

		Location								Cumulative							Sewer Parameters						Flow Design					
		1	2				3				4		5	6		7	8	9	10	11	12	13	14	15	16	17	20
Phase	Drain Area	Location	From (Label)	From Chainage		From Proposed Grade	To (Label)	To Chainage		To Proposed Grade	Contributing Blocks	Catchment Area (m2)	Percentage (%)	Equivalent Employees	Cumulative Equivalent Employees	Commerical Hotel Rooms	Peak Design Flow, Qp [L/s]	Pipe Length [m]	U/S Invert [m]	D/S Invert [m]	Proposed Sewer Slope [%]	Pipe Size, [mm]	Pipe Capacity Qf [L/s]	Capacity Ratio Qp/Qf	Velocity Ratio Vp/Vf	Full Flow Velocity [m/s]	Peak Design Velocity [m/s]	Comments/Areas
Phase 2 - Business Park	A	Street 15	SAP 1	15+	37.202	111.12		15+	125.000	111.39	BLK 1	8,535.076	2.82%	17.47	17.47		0.030	87.80	108.88	108.62	0.30%	147	7.904	0.00	0.00	0.47	0.00	Start of run
	A	Street 15		15+	125.000	111.39		15+	175.000	111.19	BLK 2	6,390.598	2.11%	13.08	30.56		0.053	50.00	108.62	108.45	0.33%	147	8.332	0.01	0.00	0.49	0.00	
	A	Street 15		15+	175.000	111.19		15+	250.000	110.89	BLK 3	6,359.889	2.10%	13.02	43.58		0.076	75.00	108.45	108.15	0.40%	147	9.125	0.01	0.00	0.54	0.00	
	A	Street 15		15+	250.000	110.89		15+	325.000	110.59	BLK 4	6,364.207	2.10%	13.03	56.61		0.098	75.00	108.15	107.85	0.40%	147	9.127	0.01	0.25	0.54	0.14	
	A	Street 15		15+	325.000	110.59		15+	550.000	109.69	BLK 5	22,607.763	7.47%	46.28	102.89		0.179	225.00	107.85	106.95	0.40%	147	9.126	0.02	0.25	0.54	0.14	
	B	Street 16	SAP	76+	241.992	110.47		76+	200.000	110.57	-	-	-	-	-	-	-	41.99	108.11	107.90	0.52%	-	-	-	-	-	-	
	B	Street 16	SAP 2	76+	200.000	110.57		76+	150.000	110.33	BLK 7, 8	21,664.782	7.15%	44.35	44.35		0.077	50.00	107.90	107.64	0.52%	147	10.410	0.01	0.00	0.61	0.00	Start of run
	B	Street 16		76+	150.000	110.33		76+	100.000	110.08	BLK 6, 9	24,713.575	8.16%	50.59	94.95		0.165	50.00	107.64	107.37	0.52%	147	10.436	0.02	0.25	0.61	0.16	
	B	Street 16		76+	100.000	110.08		76+	9.137	109.58	-	0	0	0.00	94.95		0.165	90.86	107.37	106.90	0.52%	147	10.452	0.02	0.25	0.62	0.16	
								15+	569.557																			
	C	Street 15		15+	550.000	109.69		15+	569.557	109.61	-	0	0	0.00	102.89		0.179	19.56	106.95	106.88	0.39%	147	9.031	0.02	0.25	0.53	0.13	
	C	Street 15		15+	569.557	109.61		15+	575.000	109.59		0	0	0.00	197.84		0.343	5.44	106.88	106.85	0.43%	147	9.462	0.04	0.37	0.56	0.21	
	C	Street 15		15+	575.000	109.59		15+	675.000	109.19	BLK 10	8,902.465	2.94%	18.23	216.06		0.375	100.00	106.85	106.45	0.40%	147	9.127	0.04	0.40	0.54	0.22	
	C	Street 15		15+	675.000	109.19		15+	800.000	108.69	BLK 11	10,868.815	3.59%	22.25	238.31		0.414	125.00	106.45	105.95	0.40%	147	9.126	0.05	0.40	0.54	0.22	
	C	Street 15		15+	800.000	108.69		15+	969.189	107.76	BLK 12	20,614.462	6.81%	42.20	280.52		0.487	169.19	105.95	105.13	0.49%	147	10.095	0.05	0.40	0.59	0.24	
				15+	969.189	107.76	Future Connection	15+	975.000	107.89	Future Phase			1,778	2058.52		3.574	5.81	105.13	105.09	0.70%	192	24.618	0.15	0.59	0.85	0.50	
	C	Street 15		15+	975.000	107.89		16+	40.093	107.38	BLK 13	29,314.258	9.68%	60.01	2118.53		3.678	65.09	105.09	104.55	0.83%	192	26.804	0.14	0.57	0.93	0.53	
	C	Street 15		16+	40.093	107.38	Elbow to SPS	16+	110.287	106.67	-	0	0	0.00	2118.53		3.678	70.19	104.55	103.85	0.99%	192	29.266	0.13	0.56	1.01	0.57	
	D	Street 17	SAP 17A	17+	283.160	109.72		17+	358.052	109.17	BLK 21,20	17,488.770	5.77%	35.80	35.80	200	1.220	74.89	107.59	106.84	1.00%	147	14.437	0.08	0.49	0.85	0.42	Start of run
	D	Street 17		17+	358.052	109.17		17+	477.639	108.94	BLK 19,18	17,497.693	5.78%	35.82	71.63		1.282	119.59	106.84	106.37	0.40%	147	9.126	0.14	0.59	0.54	0.32	
	D	Street 17		17+	477.639	108.94		17+	548.272	108.74	BLK 17	15,253.792	5.04%	31.23	102.85		1.336	70.63	106.37	105.96	0.57%	147	10.916	0.12	0.56	0.64	0.36	
	E	Street 17		17+	548.272	108.74		17+	659.939	107.75	BLK 16	28409.356	9.38%	58.16	161.02		1.437	111.67	105.96	105.40	0.50%	147	10.196	0.14	0.59	0.60	0.35	
	E	Street 17		17+	659.939	107.75		17+	694.810	107.58	-	0	0	0.00	161.02		1.437	34.87	105.40	105.15	0.73%	147	12.321	0.12	0.54	0.73	0.40	
	E	Street 17		17+	694.810	107.58		17+	726.161	107.27	-	0	0	0.00	161.02		1.437	31.35	105.15	104.84	0.98%	147	14.252	0.10	0.52	0.84	0.44	
	E	Street 17		17+	726.161	107.27		17+	762.460	106.90		0	0	0.00	161.02		1.437	36.30	104.84	104.47	1.03%	147	14.626	0.10	0.51	0.86	0.44	
	E	Street 17		17+	762.460	106.90		17+	789.081	106.61	BLK 15	32200.591	10.63%	65.92	226.94		1.551	26.62	104.47	104.19	1.04%	147	14.723	0.11	0.52	0.87	0.45	
	E	Street 17		17+	789.081	106.61	90° Elbow	17+	807.126	106.13	-	0	0	0.00	226.94		1.551	18.05	104.19	104.02	0.99%	147	14.352	0.11	0.52	0.85	0.44	
	E	Street 18	90° Elbow	17+	807.126	106.13	45° Elbow-1	18+	297.413	105.81	-	0	0	0.00	226.94		1.551	53.72	104.02	102.94	2.00%	147	20.418	0.08	0.48	1.20	0.58	
				18+	243.698	106.50																						
	E	Street 18	45° Elbow-1	18+	297.413	105.81	45° Elbow-2	18+	300.967	105.76	-	0	0	0.00	226.94		1.551	5.03	102.94	102.90	0.84%	147	13.190	0.12	0.54	0.78	0.42	
								19+	20.215		-																	
	F	Street 19	45° Elbow-2	19+	20.215	105.27	45° Elbow-3	19+	187.830	105.27	BLK 14	25,659.231	8.47%	52.53	279.47		1.643	167.62	102.90	102.35	0.33%	147	8.289	0.20	0.64	0.49	0.31	
											-																	
	F	Street 19	45° Elbow-3	19+	187.830	105.27	45° Elbow-4	19+	194.315	104.32		0	0	0.00	279.47		1.643	6.48	102.35	102.33	0.33%	147	8.290	0.20	0.64	0.49	0.31	
	F	Street 19	45° Elbow-4	19+	194.315	104.32		19+	275.000	104.71		0	0	0.00	279.47		1.643	80.69	102.33	102.06	0.33%	147	8.337	0.20	0.64	0.49	0.31	
	F	Street 19		19+	275.000	104.71	45° Elbow-5	19+	332.796	105.38		0	0	0.00	279.47		1.643	57.80	102.06	101.87	0.33%	147	8.258	0.20	0.64	0.49	0.31	
	F	Street 19		19+	332.796	105.38	Siphon MH-2	19+	355.774	105.32		0	0	0.00	279.47		1.643	22.98	101.87	101.79	0.33%	147	8.244	0.20	0.64	0.49	0.31	
	F	Street 19	Siphon MH-2	19+	355.774	105.32	Siphon MH-1	19+	457.535	106.00		0	0	0.00	279.47		1.643	101.76	101.79	101.04	0.75%	147	12.497	0.13	0.57	0.74	0.42	Inverted Siphon
	F	Street 19	Siphon MH-1	19+	457.535	106.00	45° Elbow-6	19+	488.329	106.18		0	0	0.00	279.47		1.643	30.79	101.04	100.94	0.33%	147	8.326	0.20	0.64	0.49	0.31	
	F	Street 19	45° Elbow-6	19+	488.329	106.18	SPS MH	19+	556.032	107.00		0	0	0.00	279.47		1.643	67.70	100.94	100.71	0.33%	147	8.291	0.20	0.64	0.49	0.31	

NOTES:

n = Manning's coefficient = 0.013

q = Average daily per employee flow = 75 L/cap/d

q = Average daily per restaurant seat flow = 125 L/cap/d

q = Average daily per hotel room flow = 250 L/cap/d

q = Average daily per office staff flow = 75 L/cap/d

I = Unit average extraneous flow (new) = 0.00

M = Peak Factor (Harmon) = 2.00

$$M = 1 + \frac{14}{4 + \sqrt{P}}$$

where M_{MAX} = 4.5

M_{MIN} = 2.0

Min. pipe cover = 2.20

PROJECT: West Capital Airpark, Ottawa, Ontario

PROJECT No.: 06001

Date: May 6th, 2024

DESIGNED BY: Y.Wang

CHECKED BY: W.G.Stefan

REVISION DATE: June 17th, 2024; September 27th, 2024; November 15th, 2024

CLEARFORD WATER SYSTEMS INC.
300-1545 Carling Ave, Ottawa, ON K1Z 8P9
Tel: (613)599-6474, Fax: (613)599-7478

06001-West Captial Airpark Business Park Development: Clearford SBS® Sanitary Sewer Design Sheet - Scenario 5-A

		Location								Cumulative							Sewer Parameters					Flow Design					
		1	2				3				4		5	6		7	8	9	10	11	12	13	14	15	16	17	20
Phase	Drain Area	Location	From (Label)	From Chainage		From Proposed Grade	To (Label)	To Chainage		To Proposed Grade	Contributing Blocks	Catchment Area (m2)	Percentage (%)	Equivalent Employees	Cumulative Equivalent Employees	Restaurant Seats	Peak Design Flow, Qp [L/s]	Pipe Length [m]	U/S Invert [m]	D/S Invert [m]	Proposed Sewer Slope [%]	Pipe Size, [mm]	Pipe Capacity Qf [L/s]	Capacity Ratio Qp/Qf	Velocity Ratio Vp/Vf	Full Flow Velocity [m/s]	Peak Design Velocity [m/s]	Comments/Areas
Phase 2 - Business Park	A	Street 15	SAP 1	15+	37.202	111.12		15+	125.000	111.39	BLK 1	8,535.076	2.82%	18.04	18.04	50	0.176	87.80	108.88	108.62	0.30%	147	7.904	0.02	0.33	0.47	0.15	Start of run
	A	Street 15		15+	125.000	111.39		15+	175.000	111.19	BLK 2	6,390.598	2.11%	13.51	31.54		0.199	50.00	108.62	108.45	0.33%	147	8.332	0.02	0.33	0.49	0.16	
	A	Street 15		15+	175.000	111.19		15+	250.000	110.89	BLK 3	6,359.889	2.10%	13.44	44.98		0.223	75.00	108.45	108.15	0.40%	147	9.125	0.02	0.33	0.54	0.18	
	A	Street 15		15+	250.000	110.89		15+	325.000	110.59	BLK 4	6,364.207	2.10%	13.45	58.43		0.246	75.00	108.15	107.85	0.40%	147	9.127	0.03	0.33	0.54	0.18	
	A	Street 15		15+	325.000	110.59		15+	550.000	109.69	BLK 5	22,607.763	7.47%	47.78	106.21		0.329	225.00	107.85	106.95	0.40%	147	9.126	0.04	0.37	0.54	0.20	
	B	Street 16	SAP	76+	241.992	110.47		76+	200.000	110.57	-	-	-	-	-	-	-	41.99	108.11	107.90	0.52%	-	-	-	-	-	-	
	B	Street 16	SAP 2	76+	200.000	110.57		76+	150.000	110.33	BLK 7, 8	21,664.782	7.15%	45.78	45.78		0.224	50.00	107.90	107.64	0.52%	147	10.410	0.02	0.33	0.61	0.20	Start of run
	B	Street 16		76+	150.000	110.33		76+	100.000	110.08	BLK 6, 9	24,713.575	8.16%	52.23	98.01		0.315	50.00	107.64	107.37	0.52%	147	10.436	0.03	0.37	0.61	0.23	
	B	Street 16		76+	100.000	110.08		76+	9.137	109.58	-	0	0	0.00	98.01		0.315	90.86	107.37	106.90	0.52%	147	10.452	0.03	0.37	0.62	0.23	
								15+	569.557																			
	C	Street 15		15+	550.000	109.69		15+	569.557	109.61	-	0	0	0.00	106.21		0.329	19.56	106.95	106.88	0.39%	147	9.031	0.04	0.37	0.53	0.20	
	C	Street 15		15+	569.557	109.61		15+	575.000	109.59		0	0	0.00	204.22		0.499	5.44	106.88	106.85	0.43%	147	9.462	0.05	0.43	0.56	0.24	
	C	Street 15		15+	575.000	109.59		15+	675.000	109.19	BLK 10	8,902.465	2.94%	18.81	223.03		0.532	100.00	106.85	106.45	0.40%	147	9.127	0.06	0.43	0.54	0.23	
	C	Street 15		15+	675.000	109.19		15+	800.000	108.69	BLK 11	10,868.815	3.59%	22.97	246.00		0.572	125.00	106.45	105.95	0.40%	147	9.126	0.06	0.46	0.54	0.25	
	C	Street 15		15+	800.000	108.69		15+	969.189	107.76	BLK 12	20,614.462	6.81%	43.56	289.57		0.647	169.19	105.95	105.13	0.49%	147	10.095	0.06	0.46	0.59	0.27	
	C	Street 15		15+	969.189	107.76	Future Connection	15+	975.000	107.89	Future Phase			1,778	2067.57		3.734	5.81	105.13	105.09	0.70%	192	24.618	0.15	0.60	0.85	0.51	
	C	Street 15		15+	975.000	107.89		16+	40.093	107.38	BLK 13	29,314.258	9.68%	61.95	2129.52		3.842	65.09	105.09	104.55	0.83%	192	26.804	0.14	0.59	0.93	0.55	
	C	Street 15		16+	40.093	107.38	Elbow to SPS	16+	110.287	106.67	-	0	0	0.00	2129.52		3.842	70.19	104.55	103.85	0.99%	192	29.266	0.13	0.57	1.01	0.58	
	D	Street 17	SAP 17A	17+	283.160	109.72		17+	358.052	109.17	BLK 21,20	17,488.770	5.77%	36.96	36.96		0.064	74.89	107.59	106.84	1.00%	147	14.437	0.00	0.00	0.85	0.00	Start of run
	D	Street 17		17+	358.052	109.17		17+	477.639	108.94	BLK 19,18	17,497.693	5.78%	36.98	73.94		0.128	119.59	106.84	106.37	0.40%	147	9.126	0.01	0.25	0.54	0.14	
	D	Street 17		17+	477.639	108.94		17+	548.272	108.74	BLK 17	15,253.792	5.04%	32.24	106.17		0.184	70.63	106.37	105.96	0.57%	147	10.916	0.02	0.25	0.64	0.16	
	E	Street 17		17+	548.272	108.74		17+	659.939	107.75	BLK 16	28409.356	9.38%	60.04	166.21		0.289	111.67	105.96	105.40	0.50%	147	10.196	0.03	0.33	0.60	0.20	
	E	Street 17		17+	659.939	107.75		17+	694.810	107.58	-	0	0	0.00	166.21		0.289	34.87	105.40	105.15	0.73%	147	12.321	0.02	0.33	0.73	0.24	
	E	Street 17		17+	694.810	107.58		17+	726.161	107.27	-	0	0	0.00	166.21		0.289	31.35	105.15	104.84	0.98%	147	14.252	0.02	0.33	0.84	0.28	
	E	Street 17		17+	726.161	107.27		17+	762.460	106.90		0	0	0.00	166.21		0.289	36.30	104.84	104.47	1.03%	147	14.626	0.02	0.25	0.86	0.22	
	E	Street 17		17+	762.460	106.90		17+	789.081	106.61	BLK 15	32200.591	10.63%	68.05	234.26		0.407	26.62	104.47	104.19	1.04%	147	14.723	0.03	0.33	0.87	0.29	
	E	Street 17		17+	789.081	106.61	90° Elbow	17+	807.126	106.13	-	0	0	0.00	234.26		0.407	18.05	104.19	104.02	0.99%	147	14.352	0.03	0.33	0.85	0.28	
	E	Street 18	90° Elbow	17+	807.126	106.13	45° Elbow-1	18+	297.413	105.81	-	0	0	0.00	234.26		0.407	53.72	104.02	102.94	2.00%	147	20.418	0.02	0.25	1.20	0.30	
				18+	243.698	106.50																						
	E	Street 18	45° Elbow-1	18+	297.413	105.81	45° Elbow-2	18+	300.967	105.76	-	0	0	0.00	234.26		0.407	5.03	102.94	102.90	0.84%	147	13.190	0.03	0.37	0.78	0.29	
								19+	20.215		-																	
	F	Street 19	45° Elbow-2	19+	20.215	105.27	45° Elbow-3	19+	187.830	105.27	BLK 14	25,659.231	8.47%	54.23	288.48		0.501	167.62	102.90	102.35	0.33%	147	8.289	0.06	0.46	0.49	0.22	
											-																	
	F	Street 19	45° Elbow-3	19+	187.830	105.27	45° Elbow-4	19+	194.315	104.32		0	0	0.00	288.48		0.501	6.48	102.35	102.33	0.33%	147	8.290	0.06	0.46	0.49	0.22	
	F	Street 19	45° Elbow-4	19+	194.315	104.32		19+	275.000	104.71		0	0	0.00	288.48		0.501	80.69	102.33	102.06	0.33%	147	8.337	0.06	0.46	0.49	0.22	
	F	Street 19		19+	275.000	104.71	45° Elbow-5	19+	332.796	105.38		0	0	0.00	288.48		0.501	57.80	102.06	101.87	0.33%	147	8.258	0.06	0.46	0.49	0.22	
	F	Street 19		19+	332.796	105.38	Siphon MH-2	19+	355.774	105.32		0	0	0.00	288.48		0.501	22.98	101.87	101.79	0.33%	147	8.244	0.06	0.46	0.49	0.22	
	F	Street 19	Siphon MH-2	19+	355.774	105.32	Siphon MH-1	19+	457.535	106.00		0	0	0.00	288.48		0.501	101.76	101.79	101.04	0.75%	147	12.497	0.04	0.40	0.74	0.30	Inverted Siphon
	F	Street 19	Siphon MH-1	19+	457.535	106.00	45° Elbow-6	19+	488.329	106.18		0	0	0.00	288.48		0.501	30.79	101.04	100.94	0.33%	147	8.326	0.06	0.46	0.49	0.22	
	F	Street 19	45° Elbow-6	19+	488.329	106.18	SPS MH	19+	556.032	107.00		0	0	0.00	288.48		0.501	67.70	100.94	100.71	0.33%	147	8.291	0.06	0.46	0.49	0.22	

NOTES:

n = Manning's coefficient 0.013
q = Average daily per employee flow = 75 L/cap/d
q = Average daily per restaurant seat flow = 125 L/cap/d
q = Average daily per hotel room flow = 250 L/cap/d
q = Average daily per office staff flow = 75 L/cap/d

I = Unit average extraneous flow (new) = 0.00
M = Peak Factor (Harmon)= $M = 1 + \frac{14}{4 + \sqrt{P}}$ 2.00
where M_{MAX} = 4.5
M_{MIN} = 2.0

Min. pipe cover = 2.20

PROJECT: West Capital Airpark, Ottawa, Ontario
PROJECT No.: 06001
Date: May 6th, 2024
DESIGNED BY: Y.Wang
CHECKED BY: W.G.Stefan
REVISION DATE: June 17th, 2024; September 27th, 2024; November 15th, 2024

CLEARFORD WATER SYSTEMS INC.
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Tel: (613)599-6474, Fax: (613)599-7478

06001-West Captial Airpark Business Park Development: Clearford SBS® Sanitary Sewer Design Sheet - Scenario 5-B

		Location								Cumulative						Sewer Parameters						Flow Design					
		1	2				3				4		5	6		7	8	9	10	11	12	13	14	15	16	17	20
Phase	Drain Area	Location	From (Label)	From Chainage	From Proposed Grade	To (Label)	To Chainage	To Proposed Grade	Contributing Blocks	Catchment Area (m2)	Percentage (%)	Equivalent Employees	Cumulative Equivalent Employees	Restaurant Seats	Peak Design Flow, Qp [L/s]	Pipe Length [m]	U/S Invert [m]	D/S Invert [m]	Proposed Sewer Slope [%]	Pipe Size, [mm]	Pipe Capacity Qf [L/s]	Capacity Ratio Qp/Qf	Velocity Ratio Vp/Vf	Full Flow Velocity [m/s]	Peak Design Velocity [m/s]	Comments/Areas
Phase 2 - Business Park	A	Street 15	SAP 1	15+ 37.202	111.12		15+ 125.000	111.39	BLK 1	8,535.076	2.82%	18.04	18.04		0.031	87.80	108.88	108.62	0.30%	147	7.904	0.00	0.00	0.47	0.00	Start of run
	A	Street 15		15+ 125.000	111.39		15+ 175.000	111.19	BLK 2	6,390.598	2.11%	13.51	31.54		0.055	50.00	108.62	108.45	0.33%	147	8.332	0.01	0.00	0.49	0.00	
	A	Street 15		15+ 175.000	111.19		15+ 250.000	110.89	BLK 3	6,359.889	2.10%	13.44	44.98		0.078	75.00	108.45	108.15	0.40%	147	9.125	0.01	0.00	0.54	0.00	
	A	Street 15		15+ 250.000	110.89		15+ 325.000	110.59	BLK 4	6,364.207	2.10%	13.45	58.43		0.101	75.00	108.15	107.85	0.40%	147	9.127	0.01	0.25	0.54	0.14	
	A	Street 15		15+ 325.000	110.59		15+ 550.000	109.69	BLK 5	22,607.763	7.47%	47.78	106.21		0.184	225.00	107.85	106.95	0.40%	147	9.126	0.02	0.33	0.54	0.18	
	B	Street 16	SAP	76+ 241.992	110.47		76+ 200.000	110.57	-	-	-	-	-	-	-	41.99	108.11	107.90	0.52%	-	-	-	-	-	-	
	B	Street 16	SAP 2	76+ 200.000	110.57		76+ 150.000	110.33	BLK 7, 8	21,664.782	7.15%	45.78	45.78		0.079	50.00	107.90	107.64	0.52%	147	10.410	0.01	0.00	0.61	0.00	Start of run
	B	Street 16		76+ 150.000	110.33		76+ 100.000	110.08	BLK 6, 9	24,713.575	8.16%	52.23	98.01		0.170	50.00	107.64	107.37	0.52%	147	10.436	0.02	0.25	0.61	0.16	
	B	Street 16		76+ 100.000	110.08		76+ 9.137	109.58	-	0	0	0.00	98.01		0.170	90.86	107.37	106.90	0.52%	147	10.452	0.02	0.25	0.62	0.16	
							15+ 569.557																			
	C	Street 15		15+ 550.000	109.69		15+ 569.557	109.61	-	0	0	0.00	106.21		0.184	19.56	106.95	106.88	0.39%	147	9.031	0.02	0.33	0.53	0.18	
	C	Street 15		15+ 569.557	109.61		15+ 575.000	109.59		0	0	0.00	204.22		0.355	5.44	106.88	106.85	0.43%	147	9.462	0.04	0.37	0.56	0.21	
	C	Street 15		15+ 575.000	109.59		15+ 675.000	109.19	BLK 10	8,902.465	2.94%	18.81	223.03		0.387	100.00	106.85	106.45	0.40%	147	9.127	0.04	0.40	0.54	0.22	
	C	Street 15		15+ 675.000	109.19		15+ 800.000	108.69	BLK 11	10,868.815	3.59%	22.97	246.00		0.427	125.00	106.45	105.95	0.40%	147	9.126	0.05	0.40	0.54	0.22	
	C	Street 15		15+ 800.000	108.69		15+ 969.189	107.76	BLK 12	20,614.462	6.81%	43.56	289.57		0.503	169.19	105.95	105.13	0.49%	147	10.095	0.05	0.40	0.59	0.24	
	C	Street 15		15+ 969.189	107.76	Future Connection	15+ 975.000	107.89	Future Phase			1,778	2067.57		3.590	5.81	105.13	105.09	0.70%	192	24.618	0.15	0.59	0.85	0.50	
	C	Street 15		15+ 975.000	107.89		16+ 40.093	107.38	BLK 13	29,314.258	9.68%	61.95	2129.52		3.697	65.09	105.09	104.55	0.83%	192	26.804	0.14	0.57	0.93	0.53	
	C	Street 15		16+ 40.093	107.38	Elbow to SPS	16+ 110.287	106.67	-	0	0	0.00	2129.52		3.697	70.19	104.55	103.85	0.99%	192	29.266	0.13	0.56	1.01	0.57	
	D	Street 17	SAP 17A	17+ 283.160	109.72		17+ 358.052	109.17	BLK 21,20	17,488.770	5.77%	36.96	36.96	50	0.209	74.89	107.59	106.84	1.00%	147	14.437	0.01	0.25	0.85	0.21	Start of run
	D	Street 17		17+ 358.052	109.17		17+ 477.639	108.94	BLK 19,18	17,497.693	5.78%	36.98	73.94		0.273	119.59	106.84	106.37	0.40%	147	9.126	0.03	0.33	0.54	0.18	
	D	Street 17		17+ 477.639	108.94		17+ 548.272	108.74	BLK 17	15,253.792	5.04%	32.24	106.17		0.329	70.63	106.37	105.96	0.57%	147	10.916	0.03	0.37	0.64	0.24	
	E	Street 17		17+ 548.272	108.74		17+ 659.939	107.75	BLK 16	28409.356	9.38%	60.04	166.21		0.433	111.67	105.96	105.40	0.50%	147	10.196	0.04	0.40	0.60	0.24	
	E	Street 17		17+ 659.939	107.75		17+ 694.810	107.58	-	0	0	0.00	166.21		0.433	34.87	105.40	105.15	0.73%	147	12.321	0.04	0.37	0.73	0.27	
	E	Street 17		17+ 694.810	107.58		17+ 726.161	107.27	-	0	0	0.00	166.21		0.433	31.35	105.15	104.84	0.98%	147	14.252	0.03	0.37	0.84	0.31	
	E	Street 17		17+ 726.161	107.27		17+ 762.460	106.90		0	0	0.00	166.21		0.433	36.30	104.84	104.47	1.03%	147	14.626	0.03	0.33	0.86	0.29	
	E	Street 17		17+ 762.460	106.90		17+ 789.081	106.61	BLK 15	32200.591	10.63%	68.05	234.26		0.551	26.62	104.47	104.19	1.04%	147	14.723	0.04	0.37	0.87	0.32	
	E	Street 17		17+ 789.081	106.61	90° Elbow	17+ 807.126	106.13	-	0	0	0.00	234.26		0.551	18.05	104.19	104.02	0.99%	147	14.352	0.04	0.37	0.85	0.31	
	E	Street 18	90° Elbow	17+ 807.126	106.13	45° Elbow-1	18+ 297.413	105.81	-	0	0	0.00	234.26		0.551	53.72	104.02	102.94	2.00%	147	20.418	0.03	0.33	1.20	0.40	
				18+ 243.698	106.50																					
	E	Street 18	45° Elbow-1	18+ 297.413	105.81	45° Elbow-2	18+ 300.967	105.76	-	0	0	0.00	234.26		0.551	5.03	102.94	102.90	0.84%	147	13.190	0.04	0.40	0.78	0.31	
							19+ 20.215		-																	
	F	Street 19	45° Elbow-2	19+ 20.215	105.27	45° Elbow-3	19+ 187.830	105.27	BLK 14	25,659.231	8.47%	54.23	288.48		0.646	167.62	102.90	102.35	0.33%	147	8.289	0.08	0.48	0.49	0.23	
									-																	
	F	Street 19	45° Elbow-3	19+ 187.830	105.27	45° Elbow-4	19+ 194.315	104.32		0	0	0.00	288.48		0.646	6.48	102.35	102.33	0.33%	147	8.290	0.08	0.48	0.49	0.23	
	F	Street 19	45° Elbow-4	19+ 194.315	104.32		19+ 275.000	104.71		0	0	0.00	288.48		0.646	80.69	102.33	102.06	0.33%	147	8.337	0.08	0.48	0.49	0.24	
	F	Street 19		19+ 275.000	104.71	45° Elbow-5	19+ 332.796	105.38		0	0	0.00	288.48		0.646	57.80	102.06	101.87	0.33%	147	8.258	0.08	0.48	0.49	0.23	
	F	Street 19		19+ 332.796	105.38	Siphon MH-2	19+ 355.774	105.32		0	0	0.00	288.48		0.646	22.98	101.87	101.79	0.33%	147	8.244	0.08	0.48	0.49	0.23	
	F	Street 19	Siphon MH-2	19+ 355.774	105.32	Siphon MH-1	19+ 457.535	106.00		0	0	0.00	288.48		0.646	101.76	101.79	101.04	0.75%	147	12.497	0.05	0.43	0.74	0.32	Inverted Siphon
	F	Street 19	Siphon MH-1	19+ 457.535	106.00	45° Elbow-6	19+ 488.329	106.18		0	0	0.00	288.48		0.646	30.79	101.04	100.94	0.33%	147	8.326	0.08	0.48	0.49	0.24	
	F	Street 19	45° Elbow-6	19+ 488.329	106.18	SPS MH	19+ 556.032	107.00		0	0	0.00	288.48		0.646	67.70	100.94	100.71	0.33%	147	8.291	0.08	0.48	0.49	0.23	

NOTES:

n = Manning's coefficient 0.013

q = Average daily per employee flow = 75 L/cap/d

q = Average daily per restaurant seat flow = 125 L/cap/d

q = Average daily per hotel room flow = 250 L/cap/d

q = Average daily per office staff flow = 75 L/cap/d

I = Unit average extraneous flow (new) = 0.00

M = Peak Factor (Harmon)= 2.00

$$M = 1 + \frac{14}{4 + \sqrt{P}}$$

where M_{MAX} = 4.5

M_{MIN} = 2.0

Min. pipe cover = 2.20

PROJECT: West Capital Airpark, Ottawa, Ontario

PROJECT No.: 06001

Date: May 6th, 2024

DESIGNED BY: Y.Wang

CHECKED BY: W.G.Stefan

REVISION DATE: June 17th, 2024; September 27th, 2024; November 15th, 2024

CLEARFORD WATER SYSTEMS INC.
300-1545 Carling Ave, Ottawa, ON K1Z 8P9
Tel: (613)599-6474, Fax: (613)599-7478

06001-West Captial Airpark Business Park Development: Clearford SBS® Sanitary Sewer Design Sheet - Scenario 6-A

		Location								Cumulative								Sewer Parameters					Flow Design					
		1	2			3					4		5		6		7	8	9	10	11	12	13	14	15	16	17	20
Phase	Drain Area	Location	From (Label)	From Chainage	From Proposed Grade	To (Label)	To Chainage	To Proposed Grade	Contributing Blocks	Catchment Area (m2)	Percentage (%)	Equivalent Employees	Equivalent Office Staff	Cumulative Equivalent Employees	Restaurant Seats	Peak Design Flow, Qp [L/s]	Pipe Length [m]	U/S Invert [m]	D/S Invert [m]	Proposed Sewer Slope [%]	Pipe Size, [mm]	Pipe Capacity Qf [L/s]	Capacity Ratio Qp/Qf	Velocity Ratio Vp/Vf	Full Flow Velocity [m/s]	Peak Design Velocity [m/s]	Comments/Areas
Phase 2 - Business Park	A	Street 15	SAP 1	15+ 37.202	111.12		15+ 125.000	111.39	BLK 1	8,535.076	2.82%	13.53	22.55	36.07	50	0.207	87.80	108.88	108.62	0.30%	147	7.904	0.03	0.33	0.47	0.15	Start of run
	A	Street 15		15+ 125.000	111.39		15+ 175.000	111.19	BLK 2	6,390.598	2.11%	10.13	16.88	63.08		0.254	50.00	108.62	108.45	0.33%	147	8.332	0.03	0.37	0.49	0.18	
	A	Street 15		15+ 175.000	111.19		15+ 250.000	110.89	BLK 3	6,359.889	2.10%	10.08	16.80	89.97		0.301	75.00	108.45	108.15	0.40%	147	9.125	0.03	0.37	0.54	0.20	
	A	Street 15		15+ 250.000	110.89		15+ 325.000	110.59	BLK 4	6,364.207	2.10%	10.09	16.81	116.86		0.348	75.00	108.15	107.85	0.40%	147	9.127	0.04	0.37	0.54	0.20	
	A	Street 15		15+ 325.000	110.59		15+ 550.000	109.69	BLK 5	22,607.763	7.47%	35.83	59.72	212.42		0.513	225.00	107.85	106.95	0.40%	147	9.126	0.06	0.43	0.54	0.23	
	B	Street 16	SAP	76+ 241.992	110.47		76+ 200.000	110.57	-	-	-	-	-	-	-	-	41.99	108.11	107.90	0.52%	-	-	-	-	-	-	
	B	Street 16	SAP 2	76+ 200.000	110.57		76+ 150.000	110.33	BLK 7, 8	21,664.782	7.15%	34.34	57.23	34.34		0.204	50.00	107.90	107.64	0.52%	147	10.410	0.02	0.25	0.61	0.15	Start of run
	B	Street 16		76+ 150.000	110.33		76+ 100.000	110.08	BLK 6, 9	24,713.575	8.16%	39.17	65.28	138.79		0.386	50.00	107.64	107.37	0.52%	147	10.436	0.04	0.37	0.61	0.23	
	B	Street 16		76+ 100.000	110.08		76+ 9.137	109.58	-	0	0	0.00		138.79		0.386	90.86	107.37	106.90	0.52%	147	10.452	0.04	0.37	0.62	0.23	
							15+ 569.557																				
	C	Street 15		15+ 550.000	109.69		15+ 569.557	109.61	-	0	0	0.00		212.42		0.513	19.56	106.95	106.88	0.39%	147	9.031	0.06	0.43	0.53	0.23	
	C	Street 15		15+ 569.557	109.61		15+ 575.000	109.59		0	0	0.00		351.21		0.754	5.44	106.88	106.85	0.43%	147	9.462	0.08	0.48	0.56	0.27	
	C	Street 15		15+ 575.000	109.59		15+ 675.000	109.19	BLK 10	8,902.465	2.94%	14.11	23.52	388.84		0.820	100.00	106.85	106.45	0.40%	147	9.127	0.09	0.49	0.54	0.26	
	C	Street 15		15+ 675.000	109.19		15+ 800.000	108.69	BLK 11	10,868.815	3.59%	17.23	28.71	434.77		0.899	125.00	106.45	105.95	0.40%	147	9.126	0.10	0.51	0.54	0.27	
	C	Street 15		15+ 800.000	108.69		15+ 969.189	107.76	BLK 12	20,614.462	6.81%	32.67	54.46	521.90		1.051	169.19	105.95	105.13	0.49%	147	10.095	0.10	0.52	0.59	0.31	
	C	Street 15		15+ 969.189	107.76	Future Connection	15+ 975.000	107.89	Future Phase			1,778		2299.90		4.138	5.81	105.13	105.09	0.70%	192	24.515	0.17	0.61	0.85	0.52	
	C	Street 15		15+ 975.000	107.89		16+ 40.093	107.38	BLK 13	29,314.258	9.68%	46.46	77.44	2423.80		4.353	65.09	105.09	104.55	0.83%	192	26.693	0.16	0.61	0.92	0.57	
	C	Street 15		16+ 40.093	107.38	Elbow to SPS	16+ 110.287	106.67	-	0	0	0.00		2423.80		4.353	70.19	104.55	103.85	0.99%	192	29.144	0.15	0.59	1.01	0.59	
	D	Street 17	SAP 17A	17+ 283.160	109.72		17+ 358.052	109.17	BLK 21,20	17,488.770	5.77%	27.72	46.20	73.92		0.128	74.89	107.59	106.84	1.00%	147	14.437	0.01	0.00	0.85	0.00	Start of run
	D	Street 17		17+ 358.052	109.17		17+ 477.639	108.94	BLK 19,18	17,497.693	5.78%	27.73	46.22	147.87		0.257	119.59	106.84	106.37	0.40%	147	9.126	0.03	0.33	0.54	0.18	
	D	Street 17		17+ 477.639	108.94		17+ 548.272	108.74	BLK 17	15,253.792	5.04%	24.18	40.29	212.34		0.369	70.63	106.37	105.96	0.57%	147	10.916	0.03	0.37	0.64	0.24	
	E	Street 17		17+ 548.272	108.74		17+ 659.939	107.75	BLK 16	28409.356	9.38%	45.03	75.05	332.42		0.577	111.67	105.96	105.40	0.50%	147	10.196	0.06	0.43	0.60	0.26	
	E	Street 17		17+ 659.939	107.75		17+ 694.810	107.58	-	0	0	0.00		332.42		0.577	34.87	105.40	105.15	0.73%	147	12.321	0.05	0.40	0.73	0.29	
	E	Street 17		17+ 694.810	107.58		17+ 726.161	107.27	-	0	0	0.00		332.42		0.577	31.35	105.15	104.84	0.98%	147	14.252	0.04	0.40	0.84	0.34	
	E	Street 17		17+ 726.161	107.27		17+ 762.460	106.90		0	0	0.00		332.42		0.577	36.30	104.84	104.47	1.03%	147	14.626	0.04	0.37	0.86	0.32	
	E	Street 17		17+ 762.460	106.90		17+ 789.081	106.61	BLK 15	32200.591	10.63%	51.04	85.06	468.52		0.813	26.62	104.47	104.19	1.04%	147	14.723	0.06	0.43	0.87	0.37	
	E	Street 17		17+ 789.081	106.61	90° Elbow	17+ 807.126	106.13	-	0	0	0.00		468.52		0.813	18.05	104.19	104.02	0.99%	147	14.352	0.06	0.43	0.85	0.36	
	E	Street 18	90° Elbow	17+ 807.126	106.13	45° Elbow-1	18+ 297.413	105.81	-	0	0	0.00		468.52		0.813	53.72	104.02	102.94	2.00%	147	20.418	0.04	0.37	1.20	0.45	
				18+ 243.698	106.50																						
	E	Street 18	45° Elbow-1	18+ 297.413	105.27	45° Elbow-2	18+ 301.044	105.76	-	0	0	0.00		468.52		0.813	5.03	102.94	102.90	0.84%	147	13.190	0.06	0.46	0.78	0.36	
							19+ 20.215		-																		
	F	Street 19	45° Elbow-2	19+ 20.215	105.27	45° Elbow-3	19+ 187.830	105.27	BLK 14	25,659.231	8.47%	40.67	67.78	576.97		1.002	167.62	102.90	102.35	0.33%	147	8.289	0.12	0.56	0.49	0.27	
									-																		
	F	Street 19	45° Elbow-3	19+ 187.830	105.27	45° Elbow-4	19+ 194.315	104.32		0	0	0.00		576.97		1.002	6.48	102.35	102.33	0.33%	147	8.290	0.12	0.56	0.49	0.27	
	F	Street 19	45° Elbow-4	19+ 194.315	104.32		19+ 275.000	104.71		0	0	0.00		576.97		1.002	80.69	102.33	102.06	0.33%	147	8.337	0.12	0.56	0.49	0.27	
	F	Street 19		19+ 275.000	104.71	45° Elbow-5	19+ 332.796	105.38		0	0	0.00		576.97		1.002	57.80	102.06	101.87	0.33%	147	8.258	0.12	0.56	0.49	0.27	
	F	Street 19		19+ 332.796	105.38	Siphon MH-2	19+ 355.774	105.32		0	0	0.00		576.97		1.002	22.98	101.87	101.79	0.33%	147	8.244	0.12	0.56	0.49	0.27	
	F	Street 19	Siphon MH-2	19+ 355.774	105.32	Siphon MH-1	19+ 457.535	106.00		0	0	0.00		576.97		1.002	101.76	101.79	101.04	0.75%	147	12.497	0.08	0.49	0.74	0.36	Inverted Siphon
	F	Street 19	Siphon MH-1	19+ 457.535	106.00	45° Elbow-6	19+ 488.329	106.18		0	0	0.00		576.97		1.002	30.79	101.04	100.94	0.33%	147	8.326	0.12	0.56	0.49	0.27	
	F	Street 19	45° Elbow-6	19+ 488.329	106.18	SPS MH	19+ 556.032	107.00		0	0	0.00		576.97		1.002	67.70	100.94	100.71	0.33%	147	8.291	0.12	0.56	0.49	0.27	

NOTES:

n = Manning's coefficient 0.013

q = Average daily per employee flow = 75 L/cap/d

q = Average daily per restaurant seat flow 125 L/cap/d

q = Average daily per hotel room flow = 250 L/cap/d

q = Average daily per office staff flow = 75 L/cap/d

I = Unit average extraneous flow (new) = 0.00

M = Peak Factor (Harmon) = $M = 1 + \frac{14}{4 + \sqrt{P}}$ 2.00

where M_{MAX} = 4.5

M_{MIN} = 2.0

Min. pipe cover = 2.20

PROJECT: West Capital Airpark, Ottawa, Ontario

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06001-West Captial Airpark Business Park Development: Clearford SBS® Sanitary Sewer Design Sheet - Scenario 6-B

		Location								Cumulative								Sewer Parameters					Flow Design					
		1	2				3				4		5		6		7	8	9	10	11	12	13	14	15	16	17	20
Phase	Drain Area	Location	From (Label)	From Chainage		From Proposed Grade	To (Label)	To Chainage		To Proposed Grade	Contributing Blocks	Catchment Area (m2)	Percentage (%)	Equivalent Employees	Equivalent Office Staff	Cumulative Equivalent Employees	Restaurant Seats	Peak Design Flow, Qp [L/s]	Pipe Length [m]	U/S Invert [m]	D/S Invert [m]	Proposed Sewer Slope [%]	Pipe Size, [mm]	Pipe Capacity Qf [L/s]	Capacity Ratio Qp/Qf	Velocity Ratio Vp/Vf	Full Flow Velocity [m/s]	Peak Design Velocity [m/s]	Comments/Areas
Phase 2 - Business Park	A	Street 15	SAP 1	15+	37.202	111.12		15+	125.000	111.39	BLK 1	8,535.076	2.82%	13.53	22.55	36.07		0.063	87.80	108.88	108.62	0.30%	147	7.904	0.01	0.00	0.47	0.00	Start of run
	A	Street 15		15+	125.000	111.39		15+	175.000	111.19	BLK 2	6,390.598	2.11%	10.13	16.88	63.08		0.110	50.00	108.62	108.45	0.33%	147	8.332	0.01	0.25	0.49	0.12	
	A	Street 15		15+	175.000	111.19		15+	250.000	110.89	BLK 3	6,359.889	2.10%	10.08	16.80	89.97		0.156	75.00	108.45	108.15	0.40%	147	9.125	0.02	0.25	0.54	0.14	
	A	Street 15		15+	250.000	110.89		15+	325.000	110.59	BLK 4	6,364.207	2.10%	10.09	16.81	116.86		0.203	75.00	108.15	107.85	0.40%	147	9.127	0.02	0.33	0.54	0.18	
	A	Street 15		15+	325.000	110.59		15+	550.000	109.69	BLK 5	22,607.763	7.47%	35.83	59.72	212.42		0.369	225.00	107.85	106.95	0.40%	147	9.126	0.04	0.40	0.54	0.22	
	B	Street 16	SAP	76+	241.992	110.47		76+	200.000	110.57	-	-	-	-	-	-	-	-	41.99	108.11	107.90	0.52%	-	-	-	-	-	-	
	B	Street 16	SAP 2	76+	200.000	110.57		76+	150.000	110.33	BLK 7, 8	21,664.782	7.15%	34.34	57.23	34.34		0.060	50.00	107.90	107.64	0.52%	147	10.410	0.01	0.00	0.61	0.00	Start of run
	B	Street 16		76+	150.000	110.33		76+	100.000	110.08	BLK 6, 9	24,713.575	8.16%	39.17	65.28	138.79		0.241	50.00	107.64	107.37	0.52%	147	10.436	0.02	0.33	0.61	0.20	
	B	Street 16		76+	100.000	110.08		76+	9.137	109.58	-	0	0	0.00		138.79		0.241	90.86	107.37	106.90	0.52%	147	10.452	0.02	0.33	0.62	0.20	
								15+	569.557																				
	C	Street 15		15+	550.000	109.69		15+	569.557	109.61	-	0	0	0.00		212.42		0.369	19.56	106.95	106.88	0.39%	147	9.031	0.04	0.40	0.53	0.21	
	C	Street 15		15+	569.557	109.61		15+	575.000	109.59		0	0	0.00		351.21		0.610	5.44	106.88	106.85	0.43%	147	9.462	0.06	0.46	0.56	0.26	
	C	Street 15		15+	575.000	109.59		15+	675.000	109.19	BLK 10	8,902.465	2.94%	14.11	23.52	388.84		0.675	100.00	106.85	106.45	0.40%	147	9.127	0.07	0.48	0.54	0.26	
	C	Street 15		15+	675.000	109.19		15+	800.000	108.69	BLK 11	10,868.815	3.59%	17.23	28.71	434.77		0.755	125.00	106.45	105.95	0.40%	147	9.126	0.08	0.49	0.54	0.26	
	C	Street 15		15+	800.000	108.69		15+	969.189	107.76	BLK 12	20,614.462	6.81%	32.67	54.46	521.90		0.906	169.19	105.95	105.13	0.49%	147	10.095	0.09	0.49	0.59	0.29	
	C	Street 15		15+	969.189	107.76	Future Connection	15+	975.000	107.89	Future Phase			1,778		2299.90		3.993	5.81	105.13	105.09	0.70%	192	24.515	0.16	0.61	0.85	0.52	
	C	Street 15		15+	975.000	107.89		16+	40.093	107.38	BLK 13	29,314.258	9.68%	46.46	77.44	2423.80		4.208	65.09	105.09	104.55	0.83%	192	26.693	0.16	0.60	0.92	0.56	
	C	Street 15		16+	40.093	107.38	Elbow to SPS	16+	110.287	106.67	-	0	0	0.00		2423.80		4.208	70.19	104.55	103.85	0.99%	192	29.144	0.14	0.59	1.01	0.59	
	D	Street 17	SAP 17A	17+	283.160	109.72		17+	358.052	109.17	BLK 21,20	17,488.770	5.77%	27.72	46.20	73.92	50	0.273	74.89	107.59	106.84	1.00%	147	14.437	0.02	0.25	0.85	0.21	Start of run
	D	Street 17		17+	358.052	109.17		17+	477.639	108.94	BLK 19,18	17,497.693	5.78%	27.73	46.22	147.87		0.401	119.59	106.84	106.37	0.40%	147	9.126	0.04	0.40	0.54	0.22	
	D	Street 17		17+	477.639	108.94		17+	548.272	108.74	BLK 17	15,253.792	5.04%	24.18	40.29	212.34		0.513	70.63	106.37	105.96	0.57%	147	10.916	0.05	0.40	0.64	0.26	
	E	Street 17		17+	548.272	108.74		17+	659.939	107.75	BLK 16	28409.356	9.38%	45.03	75.05	332.42		0.722	111.67	105.96	105.40	0.50%	147	10.196	0.07	0.48	0.60	0.29	
	E	Street 17		17+	659.939	107.75		17+	694.810	107.58	-	0	0	0.00		332.42		0.722	34.87	105.40	105.15	0.73%	147	12.321	0.06	0.43	0.73	0.31	
	E	Street 17		17+	694.810	107.58		17+	726.161	107.27	-	0	0	0.00		332.42		0.722	31.35	105.15	104.84	0.98%	147	14.252	0.05	0.43	0.84	0.36	
	E	Street 17		17+	726.161	107.27		17+	762.460	106.90		0	0	0.00		332.42		0.722	36.30	104.84	104.47	1.03%	147	14.626	0.05	0.40	0.86	0.35	
	E	Street 17		17+	762.460	106.90		17+	789.081	106.61	BLK 15	32200.591	10.63%	51.04	85.06	468.52		0.958	26.62	104.47	104.19	1.04%	147	14.723	0.07	0.46	0.87	0.40	
	E	Street 17		17+	789.081	106.61	90° Elbow	17+	807.126	106.13	-	0	0	0.00		468.52		0.958	18.05	104.19	104.02	0.99%	147	14.352	0.07	0.46	0.85	0.39	
	E	Street 18	90° Elbow	17+	807.126	106.13	45° Elbow-1	18+	297.413	105.81	-	0	0	0.00		468.52		0.958	53.72	104.02	102.94	2.00%	147	20.418	0.05	0.40	1.20	0.49	
				18+	243.698	106.50																							
	E	Street 18	45° Elbow-1	18+	297.413	105.27	45° Elbow-2	18+	301.044	105.76	-	0	0	0.00		468.52		0.958	5.03	102.94	102.90	0.84%	147	13.190	0.07	0.48	0.78	0.37	
								19+	20.215		-																		
	F	Street 19	45° Elbow-2	19+	20.215	105.27	45° Elbow-3	19+	187.830	105.27	BLK 14	25,659.231	8.47%	40.67	67.78	576.97		1.146	167.62	102.90	102.35	0.33%	147	8.289	0.14	0.57	0.49	0.28	
											-																		
	F	Street 19	45° Elbow-3	19+	187.830	105.27	45° Elbow-4	19+	194.315	104.32		0	0	0.00		576.97		1.146	6.48	102.35	102.33	0.33%	147	8.290	0.14	0.57	0.49	0.28	
	F	Street 19	45° Elbow-4	19+	194.315	104.32		19+	275.000	104.71		0	0	0.00		576.97		1.146	80.69	102.33	102.06	0.33%	147	8.337	0.14	0.57	0.49	0.28	
	F	Street 19		19+	275.000	104.71	45° Elbow-5	19+	332.796	105.38		0	0	0.00		576.97		1.146	57.80	102.06	101.87	0.33%	147	8.258	0.14	0.57	0.49	0.28	
	F	Street 19		19+	332.796	105.38	Siphon MH-2	19+	355.774	105.32		0	0	0.00		576.97		1.146	22.98	101.87	101.79	0.33%	147	8.244	0.14	0.57	0.49	0.28	
	F	Street 19	Siphon MH-2	19+	355.774	105.32	Siphon MH-1	19+	457.535	106.00		0	0	0.00		576.97		1.146	101.76	101.79	101.04	0.75%	147	12.497	0.09	0.51	0.74	0.38	Inverted Siphon
	F	Street 19	Siphon MH-1	19+	457.535	106.00	45° Elbow-6	19+	488.329	106.18		0	0	0.00		576.97		1.146	30.79	101.04	100.94	0.33%	147	8.326	0.14	0.57	0.49	0.28	
	F	Street 19	45° Elbow-6	19+	488.329	106.18	SPS MH	19+	556.032	107.00		0	0	0.00		576.97		1.146	67.70	100.94	100.71	0.33%	147	8.291	0.14	0.57	0.49	0.28	

NOTES:

n = Manning's coefficient 0.013

q = Average daily per employee flow = 75 L/cap/d

q = Average daily per restaurant seat flow 125 L/cap/d

q = Average daily per hotel room flow = 250 L/cap/d

q = Average daily per office staff flow = 75 L/cap/d

I = Unit average extraneous flow (new) = 0.00

M = Peak Factor (Harmon) = $M = 1 + \frac{14}{4 + \sqrt{P}}$ 2.00

where M_{MAX} = 4.5

M_{MIN} = 2.0

Min. pipe cover = 2.20

PROJECT: West Capital Airpark, Ottawa, Ontario

PROJECT No.: 06001

Date: May 6th, 2024

DESIGNED BY: Y.Wang

CHECKED BY: W.G.Stefan

REVISION DATE: June 17th, 2024; September 27th, 2024; November 15th, 2024

CLEARFORD WATER SYSTEMS INC.
300-1545 Carling Ave, Ottawa, ON K1Z 8P9
Tel: (613)599-6474, Fax: (613)599-7478