FUNCTIONAL SERVICING BRIEF

Rev 1, February 2, 2026

Submitted to: The City of Ottawa Planning Department

Submitted by:

1. Introduction

Taskforce Engineering has been retained by Waste Management of Canada Corp. to conduct a functional servicing study for a proposed Maintenance Building located at 2413 Carp Rd in Ottawa, ON in support of a site plan amendment application. The purpose of the report is to determine if there is sufficient capacity in the existing systems or if new systems are required to adequately service the proposed building.

2. Existing Conditions

2.1 General

The property is part of a larger property that is known municipally as 2393 Carp Rd which is operating as the WM West Carleton Environmental Centre landfill. The municipal property know as 2413 Carp Rd was acquired by WM and was previously operated by a cabinetry company with office and fabrication facilities located on-site. The properties have not yet been consolidated and as such, this application is in reference to the smaller parcel known as 2413 Carp Rd.

2.2 Water

There are 2 existing drilled wells on the property. One that services the office building and one that services the fabrication shop. The well records for these wells are included in the appendices.

2.3 Septic

There are 2 existing septic systems on the subject property. One that services the office building and one that services the fabrication shop. The available records for these systems are included in the appendices.

2.4 Stormwater

There is a large stormwater system with infiltration basins that was designed and installed in conjunction with the landfill expansion, which was constructed in 2024. A copy of the stormwater management report for that facility is included in the appendices.

3. Proposed Building

The proposed building is a 1,025 SM maintenance building with 662 SM of shop area and 363 SM of accessory space including storage, offices and washroom facilities. The shop area will be constructed using a pre-engineered building system while the auxiliary spaces will be constructed using conventional construction with load bearing block and wood roof trusses.

4. Servicing

4.1 Fire Protection

The site does not have municipal servicing and as such, an on-site supplemental water supply is required. The volume of on-site water that is required is calculated below in accordance with the *OFM-TG-03-1999 Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code* as well as the *City of Ottawa Technical Bulletin IWSTB-2024-05.*

When multiple buildings exist on a site, the water storage calculation shall be completed using the largest/most at risk building. The proposed maintenance building is the largest building on the property currently intended on being occupied. The existing 4,878 m2 building was utilized by a cabinet business, and is now vacant. There are no plans for occupancy or utilization by the current owner. Should the property owner decide to use the building, a building permit for change of use and renovation will be applied for, at which point the water supply for firefighting will be re-visited.

There are 2 building areas within the proposed building. The maintenance shop is of non-combustible construction with a building volume of 6,576 m3. The office building is a mix of non-combustible and combustible construction with load bearing block and wood truss roof structure and a volume of 1,788 m3.

$Q = K\ V\ S_{tot}$

Q = minimum supply of water in litres

K = water supply coefficient – 17 (Maintenance shop - F2 non-combustible construction) 18 (Office Area – D Office)

V = total building volume in cubic metres – 6,576 + 1,788 = 8,364 m3

S_{tot} = total of spatial coefficients from property line exposures – 1.0 (all LD > 10m)

Q = 17 x 6576 x 1.0 + 18 * 1,788 * 1.0 = 143,976 L

From Table J.1, Minimum Water Supply Flow Rate is = 4,500 L/min

Based on the IWSTB-2024-05, the required storage can be reduced by 57,000 L as the flow rate is 4,500L/min. Therefore Qmin = 143,976 – 57,000 **= 86,976 L of required supplementary on-site water storage**.

It is proposed to provide 2 – 45,000 L precast holding tanks complete with a dry hydrant for a total of 90,000 L of on-site water supply for fire protection.

4.2 Domestic Water

The existing well within existing fabrication shop is a 6" drilled well that is 200' deep with a ½ HP pump installed 150' below finished floor. A pump test that was performed this well on March 17, 2024 produced a sustained flow of 10 GPM at 40 psi of the 6 hr test with minimal drawdown (1.3'). It recovered 90% of its initial static level of 33'-6" within 90 minutes.

Fixture	Hydraulic Load, Fixture Units	Quantity of Fixtures	Total Fixture Units
Water Closet	5	7	35
Lavatory	2	6	12
Shower	5	2	10
Dish Sink	2	2	4
Hose Bib	2.5	2	5
Mop Sink	3	1	3
TOTAL			**69**

Based on the total fixture units listed above which include the fixture units for the scale house constructed in 2024, using the ASHRAE Modified Hunter Curve: D, the approximate water flow is 13 GPM. This exceeds the sustained flow rate of 10 GPM resulting from the above noted pump test, however, based on minimal drawdown and a quick static recovery, it is anticipated that the well has the capacity to provide sufficient water supply to meet the building demands.

As this well also supplies the existing scalehouse with a 2" water service, a 1 ½" water service to the maintenance building is proposed to be installed from the existing 2"

Water supply. A 1 ½" pipe at 40 psi provides maximum flow of 110 GPM which exceeds the anticipated demand and will provide sufficient capacity.

4.3 Septic System

The existing septic system servicing the existing shop was assessed to determine if sufficient capacity was available to accommodate the maintenance building addition. It was determined that both the existing tank and bed were not sufficient to accommodate the additional loading. As such, a new septic system is proposed to service the maintenance building sanitary loading.

An Eljen septic system has been proposed to minimize the septic footprint as the space on the site is limited with the required setbacks related to the septic system installation. The septic design parameters are as follows:

Septic Design		
Daily Design Sanitary Flow Rate (DDSF)		
Office Area (75L/9.2m2)	186.3 m2	1,502.4 L/day
Tank Sizing		
Commercial	Q (DDSF) x 3	4,507 L
	Tank Size:	4,730 L
Septic Design Cont'd		
Eljen Module Bed Sizing		
T (Percolation Rate)	20 min/cm	Native Soil
Q (DDSF)	1,502.4 L/day	
Eljen Modules: Q/95	16	
Number of Modules Proposed	18	
Filter Bed Area (QT/400)	75.2 m2	
Filter Bed Area Proposed	80 m2	

Attached in the appendix is a copy of the septic permit, and a spec sheet outlining the manufacturer information and certification for nitrogen removal.

4.4 Stormwater

There is a large stormwater management facility located on the site that was designed to accommodate the landfill expansion. This facility has sufficient capacity to receive the additional run-off generated by the proposed maintenance building development. A summary letter from WSP, the stormwater management facility design engineers, indicating that there is sufficient capacity is attached for reference.

The building run-off will be conveyed through header pipes to an existing storm water manhole, or overland conveyance to the stormwater management facility described above.

5. Maintenance, Erosion & Sediment Control

5.1 Maintenance

In order to ensure that the SWM system in place is performing as designed, operation and maintenance practices will be performed as per the MOE SWM Design Manual Section 6.3.1. This includes inspecting the SWM system during the first two years of operation after every significant storm event (approx. 4 times per year) to ensure proper functioning. After the first two years of operation, annual spring inspections will be performed to ensure the SWM system is operating as designed.

Maintenance of the quantity control facilities should include the following points and maintenance practices:

Vegetation – Annual weed control in the site storm water conveyance and storage facilities including the removal of invasive species.

Obstruction Occurrences – Obstructions and garbage should be cleaned from the SWM basin, swales, and outlet structures. Sediment may accumulate in the SWM basin over time. It is recommended that sediment be removed from the basin if it exceeds 10% of the overall storage volume.

Swales – all swales should be inspected for signs of erosion. Areas of erosion should be infilled

and affected vegetation remediated/repaired immediately.

Outlet Structure – The storm water outlet should be inspected for blockages and outlet erosion. All blockages and outlet erosion should be repaired immediately to ensure proper function of the outlet structure.

5.2 Erosion & Sediment Control

During construction, erosion and sediment control mechanisms are to be installed as specified on site plan drawing A.1b Erosion & Sediment Control Plan. They include, but are not limited to; silt fence per OPSD 219.100, straw bale check dams per OPSD 219.110, sediment catch geotextile on existing and proposed stormwater structures, and pre-fabricated mud matt over existing asphalt at the construction entrance.

The contractor is responsible for implementation, inspections, and maintaining the installations. The inspection schedule for all erosion and sediment control mechanisms is as follows:

- Normal Weather/Operations: Once per week
- Heavy excavation/grading activities: Twice per week
- Rainfall events: After rainfall
- Prolonged rainfall events: Daily

The contractor is to provide written notice to the engineer if any deficiency or damage is found, and implement the fix as directed as soon as feasible.

6. Conclusions

The following summarizes the findings of this report as it relates to the construction of the proposed maintenance facility at the WM West Carleton Environmental Centre.

5.1 The water for fire protection requirement is 86,976 L which will be provided by 2 – 45,000 L precast tanks to be installed below grade with a dry hydrant. Through consultation with the Fire Prevention officer, this hydrant is proposed to be located in the front yard, beyond the 90m distance to the building required by the Ontario Building Code. It is proposed to be installed in this location as it is better positioned to provide fire protection to the 2 existing buildings already on-site in addition to the proposed maintenance building.

5.2 The domestic water requirement for the building is 13 GPM which will be supplied by the existing well with a 1 1/2” domestic water supply line.

5.3 The sanitary loads for the building will be managed by an Eljen septic system based on a daily design sanitary flow rate of 1,502.4 L/day.

5.4 The stormwater run-off generated by the proposed maintenance building will be conveyed to existing stormwater management facilities for quantity and quality control.

Respectfully submitted,

Evan Burtt, P.Eng.
Taskforce Engineering Inc.

List of Appendices:

Appendix 1 – Existing Well Records

Appendix 2 – Existing Septic Records

Appendix 3 – Proposed Septic Permit

Appendix 4 – Proposed Septic Spec Sheet

Appendix 5 – Email Correspondence with OFS Fire Prevention Officer

Appendix 6 – Property Consolidation Scope Being Undertaken

Appendix 7 – Stormwater Memo and Stormwater Report (2015)

Appendix 1

Existing Well Records

The Ontario Water Resources Commission Act

WATER WELL RECORD

3149/5d

Water management in Ontario 1. PRINT ONLY IN SPACES PROVIDED 2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 1511894 | MUNICIP. 15005 | CON. CON 03

COUNTY OR DISTRICT: Carleton

TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE: Huntley

CON., BLOCK, TRACT, SURVEY, ETC.: 3

LOT: 005

[redacted]

ADDRESS: Box 562, Stittsville

DATE COMPLETED: DAY 26 MO. 05 YR. 72

NORTHING | RC. | ELEVATION | RC. | BASIN CODE

1 2 1511894 18 424034 5015334 4 390 4 26 JAN 12, 1975 44

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	DEPTH – FEET TO
Brown	Sand	Gravel Boulders	packed	0	28
Grey	Limestone		hard	28	43

31 0028628111 13 0043215

32

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
042	1 ☒ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL
	1 ☐ FRESH 2 ☐ SALTY 3 ☐ SULPHUR 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	DEPTH – FEET TO
5	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE	1.88	0	31 → 0031
05	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☒ OPEN HOLE		31	43 → 0043
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

MATERIAL AND TYPE	DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	DEPTH SET AT – FEET TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☒ BAILER

PUMPING RATE: 0005 GPM. DURATION OF PUMPING: 01 HOURS 00 MINS.

STATIC LEVEL	WATER LEVEL END OF PUMPING
028 FEET	030 FEET

25 WATER LEVELS DURING 1 ☒ PUMPING 2 ☐ RECOVERY

15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
030 FEET	030 FEET	030 FEET	030 FEET

IF FLOWING, GIVE RATE: GPM.

PUMP INTAKE SET AT: FEET

WATER AT END OF TEST: 1 ☐ CLEAR 2 ☒ CLOUDY

RECOMMENDED PUMP TYPE: ☒ SHALLOW ☐ DEEP

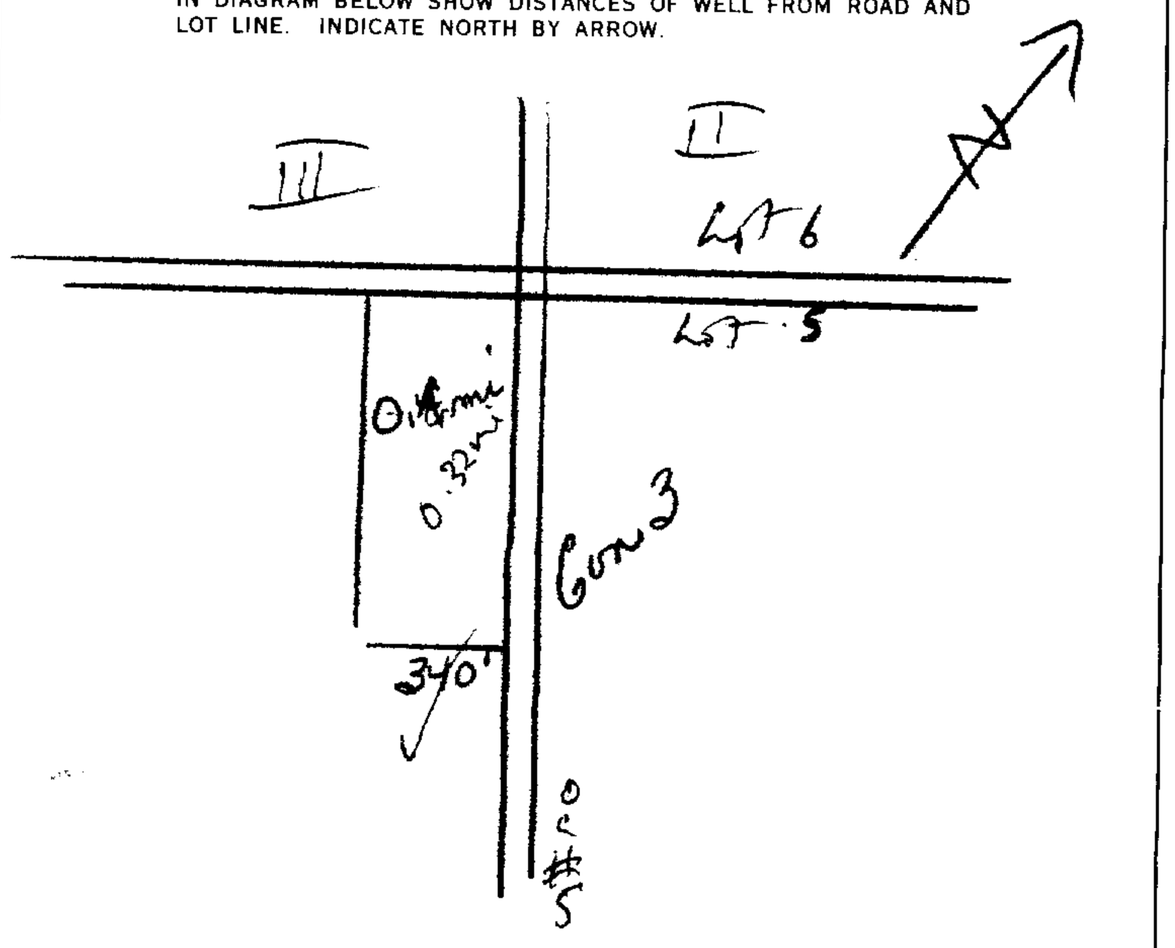
RECOMMENDED PUMP SETTING: 030 FEET

RECOMMENDED PUMPING RATE: 0004 GPM.

0025 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE 0

1 ☒ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING ☐ OTHER 9 ☐ NOT USED

METHOD OF DRILLING

1 ☒ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: Capital Water Supply Ltd — LICENCE NUMBER: 1558

ADDRESS: Box 490 Stittsville, Ont.

NAME OF DRILLER OR BORER: Boyd Cameron — LICENCE NUMBER:

SIGNATURE OF CONTRACTOR: Boyd Cameron

SUBMISSION DATE: DAY 26 MO 5 YR 72

OWRC COPY

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 1558 | DATE RECEIVED: 041072

DATE OF INSPECTION: | INSPECTOR: K

REMARKS: P R WI

UTM 18 E 421459 10 E
9 N 5025212 5 N
Elev. 9 R 03010
Basin 25 Con IV
10 + 16

ONTARIO

The Water-well Drillers Act, 1954
Department of Mines

31G5e

GROUND WATER BRANCH
AUG 20 1957
ONTARIO WATER RESOURCES COMMISSION

15 N. 51 W

Water-Well Record

County or Territorial District Carleton Township, Village, Town or City March
[redacted] n Village, Town or City)
Address Dunrobin

(day) (month) (year)

Pipe and Casing Record

Casing diameter(s) 4 in.
Length(s) 5 ft.
Type of screen -
Length of screen

Pumping Test

Static level 11 ft.
Pumping rate 20 gpm
Pumping level 20 ft.
Duration of test 20 min.

Well Log

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, or sulphur)
limestone sparla	0	1	32	21	fresh
hard ~~sand~~ sandstone	1	40	38	27	fresh

Water Record

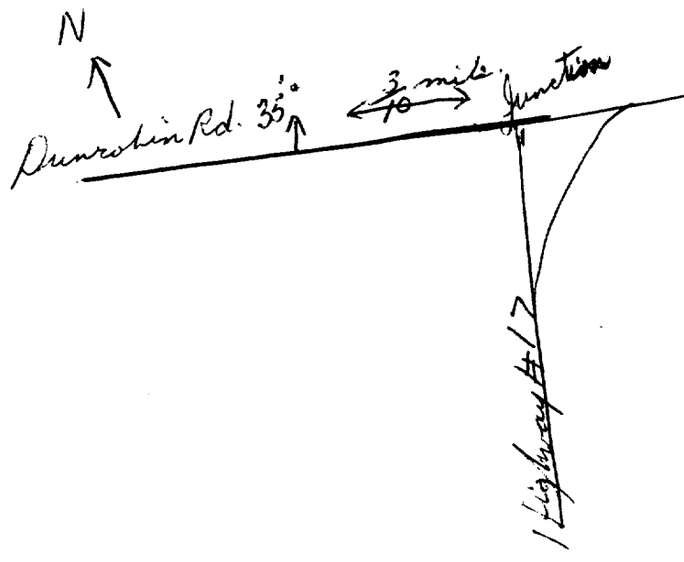
For what purpose(s) is the water to be used? Household
Is water clear or cloudy? Clear
Is well on upland, in valley, or on hillside? upland
Drilling firm R. Sparks
Address
Name of Driller R. Sparks
Address South March
Licence Number 490

I certify that the foregoing statements of fact are true.

Date Aug 17/57 R. Sparks
Signature of Licensee

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5

CSS-68

UTM 18 Z 424040 E
9 R 5015340 N

Elev. 9 R 04[illegible]5

Basic [illegible]

[illegible]

RECEIVED
JUN 30 1954
GEOLOGICAL BRANCH
DEPARTMENT of MINES

31 12

ONTARIO

The Well Drillers Act

Department of Mines, Province of Ontario

Water Well Record

County or Territorial District. Carleton Township, ~~Village, Town or City~~ Huntley

Con. 3 Lot 5 Street and Number (if in Village, Town or City)

Owner [redacted] Address

Date Completed 3 (day) June (month) 54 (year) Cost of Well (excluding pump)

Pipe and Casing Record

Casing diameter(s) 4"

Length(s) of casing(s) 50'

Type of screen

Length of screen

Distance from top of screen to ground level

Is well a gravel-wall type?

Pumping Test

Date 3 June 54

Static level 40

Pumping level 45'

Pumping rate 300 GPH

Duration of test 25' min

Distance from cylinder or bowls to ground level

Water Record

Kind (fresh or mineral) fresh

Quality (hard, soft, contains iron, sulphur, etc.) hard

Appearance (clear, cloudy, coloured) clear

For what purpose(s) is the water to be used? house

How far is well from possible source of contamination?

What is the source of contamination?

Enclose a copy of any mineral analysis that has been made of water

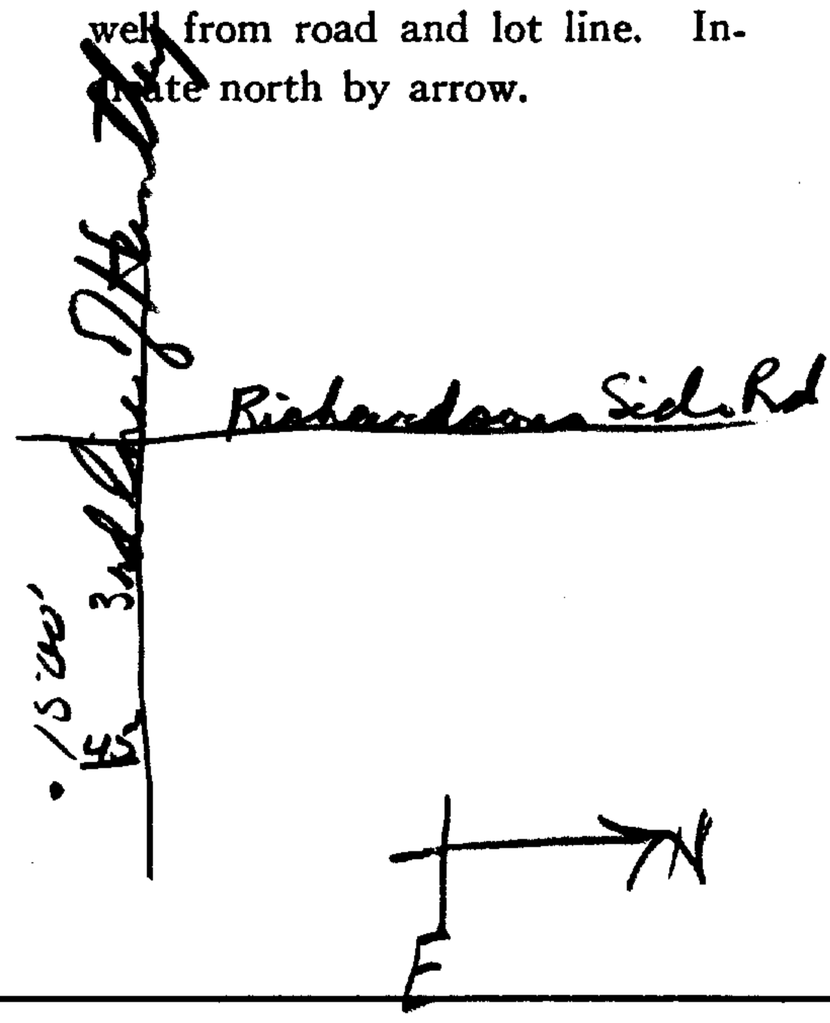
Depth(s) to Water Horizon(s)	Kind of Water	No. of Feet Water Rises
60-75'	fr	40'

Well Log

Overburden and Bedrock Record	From	To
hardpan & gravel	0 ft.	40 ft.
limestone rock	40	75'

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Situation: Is well on upland, in valley, or on hillside? hillside

Drilling Firm

Address

Name of Driller Address

Date 4 June 54 Licence Number 420

Signature of Licensee

FORM 5

CSS.58

Appendix 2

Existing Septic Records

Ministry of the Environment
Ontario

USE PERMIT
FOR CLASS 4, 5, 6 SEWAGE SYSTEMS

APPLICATION NO. 7765-III/16

INSPECTION DETAILS	TIME 1435 DATE May 5/83.	WEATHER
REPRESENTING:	THE OWNER John Lauryssen	THE INSTALLER W.R. Bourne.

1. Work authorized by the Certificate of Approval has been satisfactorily completed and includes:

a) Septic tank/~~holding tank~~ of working capacity of 1000 Imp. Gals. constructed of steel ☐ concrete ☐ fibreglass ☐ on site ☐ or prefabricated ☑ to serve 30 (~~no. of bedrooms or units~~). people.

MAKE AND MODEL, IF PREFABRICATED TANK Boyd.

b) Leaching bed of total 300 lineal feet of 3 inch diameter distribution pipe of _____ (type and product description e.g. Canron CSA Approved PVC) laid in 4 runs and fed by _____ (gravity, siphon, pump).

c) Proprietary Aerobic System: (Manufacturer) _____ (Model) _____

d) Other details _____

2. Location

a) System components installed as shown on application supporting Certificate of Approval ☑

b) If located other than in (a) use space below for sketch and dimensions from permanent points of reference sufficient to facilitate future location of tank and leaching bed including orientation of pipe runs.

3. The following work remains to be completed:—

☐ Backfill System and Complete ☐ Finish Grading to Shed Run-off and Divert Water Around Leaching Bed

☐ Stabilize All Sloped Surfaces ☐ Other . . . . . .

USE PERMIT

Under Section 59a of The Environmental Protection Act, 1971 and subject to the provisions of The Act and Regulations a Permit is hereby issued to (Owner) John Lauryssen for the use and operation of the Class 4 sewage system constructed/installed/enlarged/extended/altered persuant to the Certificate of Approval issued under the above application number in accordance with the application and Certificate of Approval with any changes indicated above and located on Lot 5 Concession 3 Ward/Township/Municipality Huntley Region/District/County RMOC. Plan No. _____ Sub-Lot No. _____

INSPECTED AND RECOMMENDED BY	PERMIT ISSUED BY	DATE ISSUED
[signature]	[signature] DIRECTOR	10 May 83

Note: Section 57(a) of The Act provides that no change can be made to any building(s) or structure(s) in connection with which this sewage system is used, if the operation or effectiveness of the sewage system will or is likely to be affected by the change, unless a new Certificate of Approval is obtained.

Section 78 of The Act provides that an applicant for a permit may appeal a decision to refuse to issue a permit. Written notice of appeal must be forwarded to the Director (who refused to issue the permit) and to the Environmental Appeal Board, 1 St. Clair Avenue West, Toronto, Ontario, M4V 1K7 within 15 days of receipt of a permit.

MOE 14-249/1042

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APPLICATION FORM AND CERTIFICATE OF APPROVAL FOR A CLASS 2-6 SEWAGE SYSTEM

(Please Print Clearly)

Application No. 77(5-III)16
Fee Receipt No. 51563
Date Received 6 April 83

1. Name of Owner	Tel. No.	2. Installer's Name	Tel. No.
John Laurysen	8365353	W R Rourke	7494251
Address (No., Street, City, Town, etc.) Box 562 Stittsville Ont K0A 3G0		Address (No., Street, City, Town, etc.) 70 Queen Mary Ottawa	

3. Propose to Re Locate (Construct/Install/Alter/Extend/Enlarge) a Class 4 sewage system to serve Shop (Facility: e.g. Single Family Dwelling, Motel, etc.)

4. Location — Region, County, District	Ward, Township, Town	Lot No.	Conc. No.	Sub.Lot. No.	Plan No.	Area of Lot (sq.ft.)
Huntley	West Carl	5	3			10 Acres

5. State No. of	Bedrooms or Motel Units	People	Flush Toilets	Urinals	Washbasins	Showers and Bathtubs
	—	20	1	1	1	—

6. Water Supply
- Dug or Bored Well ☐
- Drilled Well ☒ Municipal ☐
- Other
- Proposed ☐ or Existing ☐

7. Attach completed sketch on Page 2 — List other attachments:

8. Relationship to Severance if applicable
- ☐ Lot Approval Pending
- ☐ Lot Approved

Under Severance Application No.

9. Directions to Lot:— Highway No., Secondary Roads, Signs to Follow, etc.
1½ Mile North of Queensway on 3

10. I certify that the above information is complete and correct and that, if approved, the work will conform with Provincial requirements for sewage systems and local Municipal By-Laws. (Attach fee for Class 4, 5 or 6 systems)

Name of Agent [signature] Tel. No. 8365353
Address (No., Street, City, Town, etc.) Box 562 Stittsville Ont
Signature of Owner or Agent [signature]
Date 4 - 4 - 83

11. INSPECTOR'S REPORT

Inspection Time and Date 1315 AM/PM April 11 1983

Weather: rain.
Representing Owner: "

Leaching Bed Design Criteria	
Depth to Rock	Design H.W.T.
5'+ Ft.	5'+ Ft.

REQUIREMENTS

Lineal ~~Feet~~ of Distribution Pipe: 60m ~~500'~~

Working Capacity of Septic/~~Holding~~ Tank Imp. Gallons: 1000 gal

Sub-Surface Conditions Encountered

Rock & G.W.T.: Elevation: 0 1 2 3 4 5

Soil Type: sand & gravel.

Conditions of Approval and Reasons (e.g. fill, grading, drainage improvements, design sewage flows) ☐

OR

Reasons where Proposal not Acceptable (add additional pages if required) ☐

MOE 14-247/8/1040

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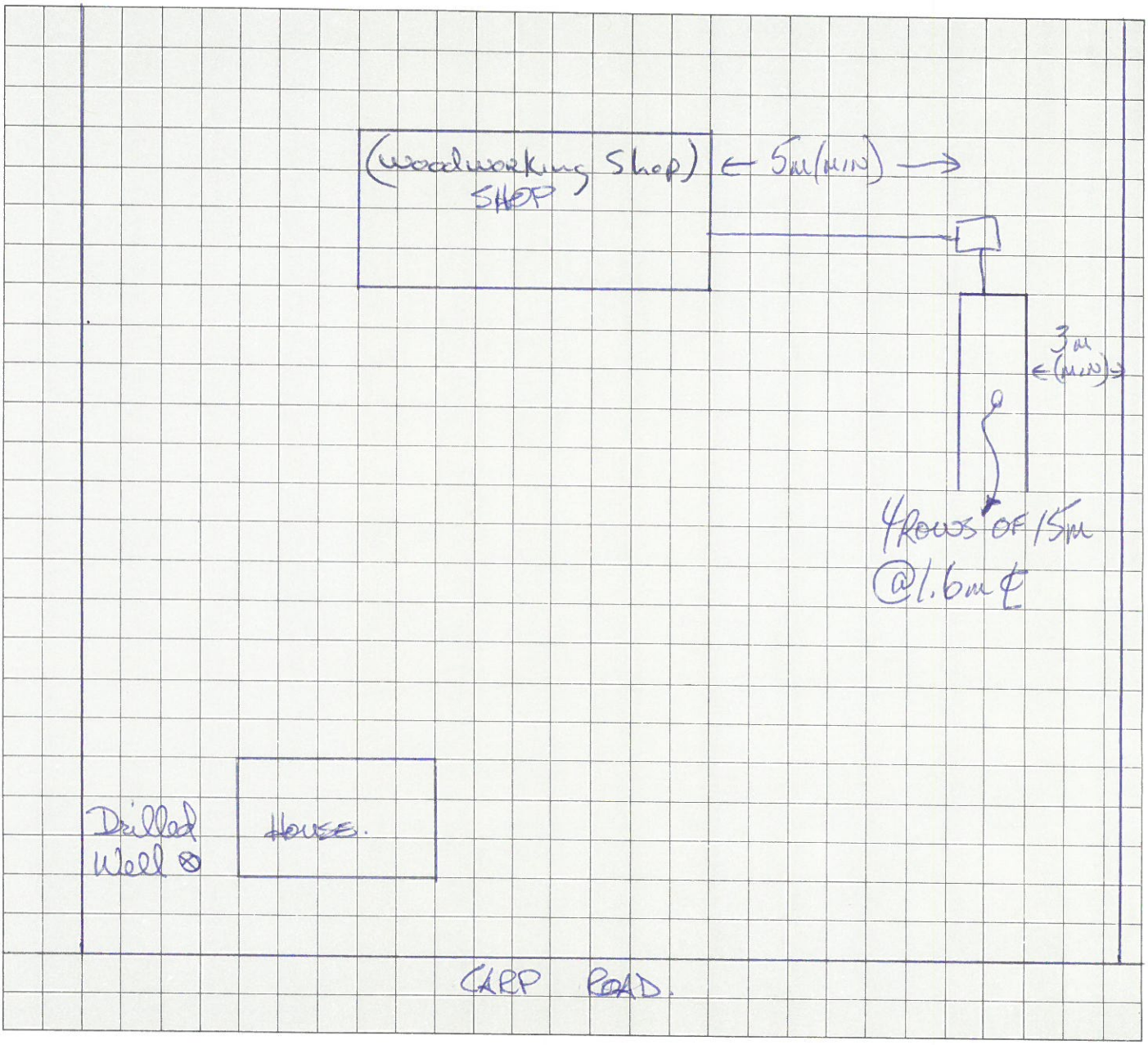
APPLICATION NO.
77(5-III)16

12. **LOT DIAGRAM AND SEWAGE SYSTEM PLAN:** — Draw to scale indicating north point and showing:
   a) Location of sewage system components (e.g. tanks, leaching bed). Locate and show horizontal distances from system to adjacent existing or proposed buildings, water supplies (including neighbours), existing on-site sewage systems, driveways, property lines, lakes, rivers, water courses, swimming pools.
   b) Lot dimensions, topographic features (e.g. swamps, steep slopes) near system.
   c) If any part of proposal conforms to a specific standard drawing, give reference number(s).



13. **A Certificate of Approval for this application is refused for the reasons given in Section 11 Page 1**

INSPECTED AND RECOMMENDED BY	REFUSED DIRECTOR	DATE

CERTIFICATE OF APPROVAL

Application approved and this Certificate of Approval under Section 65 of the Environmental Protection Act is hereby issued for the proposal outlined on Pages 1 and 2 of the application and its attachments as amended by the requirements and conditions of Section 11 provided that the sewage system shall be completed and a Use Permit issued within 12 months of the issue hereof or such extended period as the Director on application allows. DO NOT OPERATE THE SYSTEM UNTIL A USE PERMIT IS ISSUED.

INSPECTED AND RECOMMENDED BY	ISSUED DIRECTOR	DATE
[signature]	[signature]	12 April 83

Under Section 121 of the Environmental Protection Act, an applicant may appeal a decision by writing to the Director and to the Environmental Appeal Board, 1 St. Clair Avenue West, Toronto, Ont., M4V 1K7 within 15 days of receipt of the decision.

1041 3/82

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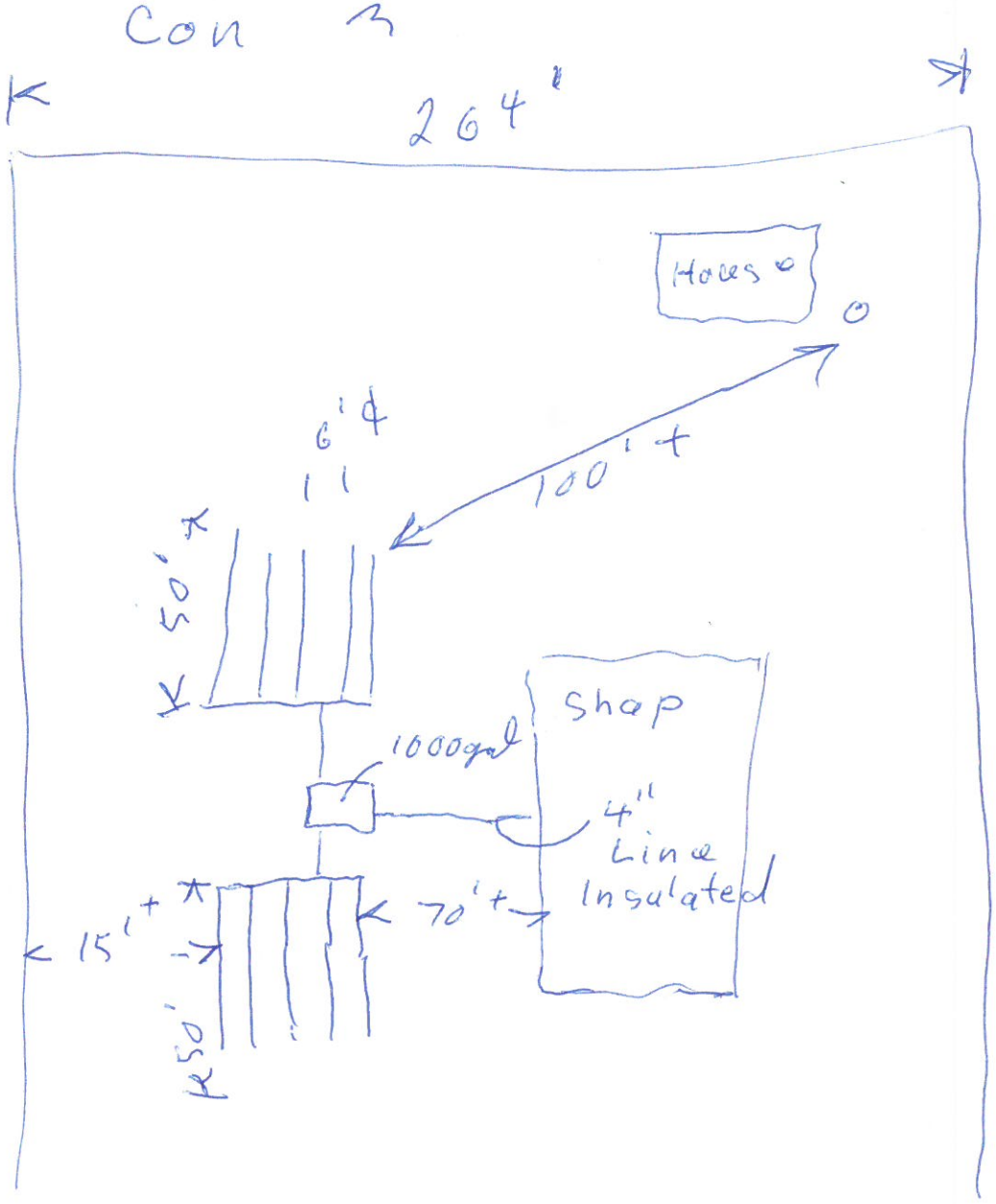
3. LOT DIAGRAM: -- Attach survey plan or complete a sketch here. The following information MUST be provided: Outline and give dimensions of Lot(s); north arrow; location of existing or proposed buildings, disposal systems, and water supply; distinctive topographical characteristics of lot; location of lake, river and all watercoursed; location of NEIGHBOURING water supplies and disposal systems within 300 ft. of your lot line.



4. PLEASE NOTIFY THIS OFFICE WHEN THE BELOW REQUIREMENTS HAVE BEEN MET:

1) A test pit, in the area of the proposed tile field, is to be dug to a depth of 5 feet, or to bedrock, or to the watertable, whichever is lesser. (The minimum diameter of 6 inches is required for the test pit.)

2) Lot corners must be clearly marked in the field.

3) At the entrance from the road prominently display your name and lot number.

Ottawa Septic System Office / Bureau des systèmes septiques d'Ottawa

Application for a Permit to Construct or Demolish

This form is authorized under the Building Code Sentence 2.4.1.1A.(2).

For use by Principal Authority	
Application number:	Permit number (if different): 05-493
Date received: July 27 2005	Roll number:

Application submitted to: Ottawa Septic System Office (RVCA)
(Name of municipality, upper-tier municipality, board of health or conservation authority)

A. Project information

Building number, street name			Unit number	Lot/con.
2415 Carp Road				5/C3
Municipality: Ottawa (West Carleton) Huntley	Postal code: K0A 1L0	Plan number/other description: 5R-11322		
Project value est. $: 17,000.00		Area of work (m^2)		

B. Applicant

Applicant is: ☐ Owner or ☑ Authorized agent of owner

Last name	First name	Corporation or partnership	
		Latimer Excavating Ltd.	
Street address: P.O. Box 649		Unit number	Lot/con.
Municipality: Stittsville	Postal code: K2S 1A7	Province: Ontario	E-mail
Telephone number: (613) 836-4106	Fax: (613) 836-4117	Cell number: ( )	

C. Owner (if different from applicant)

Last name	First name	Corporation or partnership	
		Laurysen Investments Inc.	
Street address: 2415 Carp Road		Unit number	Lot/con.
Municipality: Carp	Postal code: K0A 1L0	Province: Ontario	E-mail
Telephone number: (613) 836-5353	Fax: (613) 836-7511	Cell number: ( )	

D. Builder (optional)

Last name	First name	Corporation or partnership (if applicable)	
Street address		Unit number	Lot/con.
Municipality	Postal code	Province	E-mail
Telephone number: ( )	Fax: ( )	Cell number: ( )	

E. Purpose of application

☑ New construction ☐ Addition to an existing building ☐ Alteration/repair ☐ Demolition ☐ Conditional Permit

Proposed use of building	Current use of building
	Commercial Office Building

Description of proposed work: Replace existing Septic System

F. Tarion Warranty Corporation (Ontario New Home Warranty Program)

i. Is proposed construction for a new home as defined in the *Ontario New Home Warranties Plan Act*? If no, go to section G. ☐ Yes ☑ No

ii. Is registration required under the *Ontario New Home Warranties Plan Act*? ☐ Yes ☑ No

iii. If yes to (ii) provide registration number(s): _____

05-493

G. Attachments

i. Attach documents establishing compliance with applicable law as set out in Article 1.1.3.3.
ii. Attach Schedule 1 for each individual who reviews and takes responsibility for design activities.
iii. Attach Schedule 2 where application is to construct on-site, install or repair a sewage system.
iv. Attach types and quantities of plans and specifications for the proposed construction or demolition that are prescribed by the by-law, resolution, or regulation of the municipality, upper-tier municipality, board of health or conservation authority to which this application is made.

H. Declaration of applicant

I Latimer Excavating Ltd. certify that:
(print name)

1. The information contained in this application, attached schedules, attached plans and specifications, and other attached documentation is true to the best of my knowledge.
2. I have authority to bind the corporation or partnership (if applicable).

July 26-05
Date

Signature of applicant

Personal information contained in this form and schedules is collected under the authority of subsection 8(1.1) of the *Building Code Act, 1992*, and will be used in the administration and enforcement of the *Building Code Act, 1992*. Questions about the collection of personal information may be addressed to: a) the Chief Building Official of the municipality or upper-tier municipality to which this application is being made, or, b) the inspector having the powers and duties of a chief building official in relation to sewage systems or plumbing for an upper-tier municipality, board of health or conservation authority to whom this application is made, or, c) Director, Building and Development Branch, Ministry of Municipal Affairs and Housing 777 Bay St., 2nd Floor. Toronto, M5G 2E5 (416) 585-6666.

05-493

Schedule 1: Designer Information

Use one form for each individual who reviews and takes responsibility for design activities with respect to the project.

A. Project Information

Building number, street name		Unit no.	Lot/con.
2415 Carp Road			
Municipality	**Postal code**	**Plan number/ other description**	
Ottawa (west Carleton)	K0A 1L0	5R-11322	

B. Individual who reviews and takes responsibility for design activities

Name		Firm	
Terrilyn Latimer		Latimer Excavating Ltd.	
Street address		**Unit no.**	**Lot/con.**
P.O. Box 649			
Municipality	**Postal code**	**Province**	**E-mail**
Stittsville	K2S 1A7	Ontario	
Telephone number	**Fax number**		**Cell number**
(613) 836-4106	(613) 836-4117		( )

C. Design activities undertaken by individual identified in Section B. [Building Code Table 2.20.2.1]

☐ House	☐ HVAC – House	☐ Building Structural
☐ Small Buildings	☐ Building Services	☐ Plumbing – House
☐ Large Buildings	☐ Detection, Lighting and Power	☐ Plumbing – All Buildings
☐ Complex Buildings	☐ Fire Protection	☑ On-site Sewage Systems

Description of designer's work

Design Septic System - Class 4 - Trench.

D. Declaration of Designer

I Terrilyn Latimer declare that (choose one as appropriate):
(print name)

☑ I review and take responsibility for the design work on behalf of a firm registered under subsection 2.17.4. of the Building Code. I am qualified, and the firm is registered, in the appropriate classes/categories.

Individual BCIN: 13518

Firm BCIN: 16516

☐ I review and take responsibility for the design work and am qualified in the appropriate category as an "other designer" under subsection 2.17.5. of the Building Code.

Individual BCIN: _____

Basis for exemption from registration: _____

☐ The design work is exempt from the registration and qualification requirements of the Building Code.

Basis for exemption from registration and qualification: _____

I certify that:

1. The information contained in this schedule is true to the best of my knowledge.
2. I have authority to bind the corporation or partnership (if applicable).

July 26-05 _____
Date

_____
Signature of Designer

*For the purposes of this form, "individual" means the "person" referred to in Clause 2.17.4.7.(1)(d), Article 2.17.5.1. and all other persons who are exempt from qualification under Subsections 2.17.4. and 2.17.5.

NOTE:

1. Firm and Individual BCIN numbers are not required for building permit applications submitted prior to January 1, 2006
2. Schedule 1 does not need to be completed by architects, or holders of a Certificate of Practice or a Temporary License under the *Architects Act*.

Schedule 2: Sewage System Installer Information

A. Project Information

Building number, street name			Unit number	Lot/con.
2415 Carp Road				
Municipality	**Postal code**	**Plan number/ other description**		
Ottawa (west Carleton)	K0A 1L0	5R-11322		

B. Sewage system installer

Is the installer of the sewage system engaged in the business of constructing on-site, installing, repairing, servicing, cleaning or emptying sewage systems, in accordance with Building Code Article 2.18.1.1?

☑ Yes (Continue to Section C) ☐ No (Continue to Section E) ☐ Installer unknown at time of application (Continue to Section E)

C. Registered installer information (where answer to B is "Yes")

Name			BCIN	
Latimer Excavating Ltd.			16516	
Street address			**Unit number**	**Lot/con.**
P.O. Box 649				
Municipality	**Postal code**	**Province**	**E-mail**	
Stittsville	K2S 1A7	Ontario		
Telephone number	**Fax**		**Cell number**	
(613) 836-4106	(613) 836-4117		( )	

D. Qualified supervisor information (where answer to section B is "Yes")

Name of qualified supervisor(s)	Building Code Identification Number (BCIN)
Temilyn Latimer	13518

E. Declaration of Applicant:

I Latimer Excavating Ltd. declare that:
(print name)

☑ I am the applicant for the permit to construct the sewage system. If the installer is unknown at time of application, I shall submit a new Schedule 2 prior to construction when the installer is known;

OR

☐ I am the holder of the permit to construct the sewage system, and am submitting a new Schedule 2 now that the installer is known.

I certify that:

1. The information contained in this schedule is true to the best of my knowledge.
2. I have authority to bind the corporation or partnership (if applicable).

July 26-05 _____
Date

Signature of applicant

Ottawa Septic System Office | Bureau des systèmes septiques d'Ottawa

Do Not Complete
Permit No 05-493
Revision No _____
Date _____

Schedule 4
Proposed Services

1. Engineered
   - __ Yes
   - ↘ No

2. Water supply
   - __ Proposed
   - ↘ Existing

3. Type of work proposed
   - __ New Installation
   - ↘ Replacement
   - __ Alteration

4. Type of Well
   - __ Dug/bored/Sandpoint well
   - ↘ Drilled well
   - __ Municipal
   - __ Other

5. Residential Sewage Design Flow Info.
   - Bedrooms _____
   - House (floor area) _____ m_
   - People _____
   - Total Fixture Units _____ (Schedule 7)
   - Residential Flow _____ L/day

6. Sewage Design Flow for Other Occupancies
   Design Flow 2595 L/day
   Detailed sewage flow calculations:
   Store $279m^2 \div 1.0m^2 = 279 \times 5 = 1395$
   Office $1395m^2 \div 9.3m^2 = 15 \times 75 = 1125$ = 15 employees × 75
   Other Storage $46m^2 \div 46m^2 = 1 \times 75 = 75$

7. Type of System
   - __ Treatment Unit _____
   - __ Class 2 – Leaching Pit
   - __ Class 3 – Cesspool
   - __ Class 4 – Shallow Buried Trench
   - __ _____
   - X Class 4 – Trench
     - __ Fully raised
     - __ Partially raised
     - X In-ground
   - __ Class 4 – Filter Media
     - __ Fully raised
     - __ Partially raised
     - __ In-ground
   - __ Class 4 – Area Bed
     - __ Fully raised
     - __ Partially raised
     - __ In-ground
   - __ Class 4 – Aerobic with Trench
     - __ Fully raised
     - __ Partially raised
     - __ In-ground
   - __ Class 4 – Aerobic with Filter Media
     - __ Fully raised
     - __ Partially raised
     - __ In-ground
   - __ Class 5 – Holding Tank

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Do Not Complete
Permit No 05-493
Revision No _____
Date _____

Schedule 5
Sewage System Details

Type of System Class 4 - Trench (Schedule 4)

Septic/Holding 9500 L

Septic Tank Effluent Filter Orenco

Site to be Scarified (If in Clay) YES / NO

Clay Seal Required (If in bedrock) YES / (NO)

Trench Bed – Length of Distribution Pipe 108 m

Proposed diameter of Tile (mm/(in)) 3

Filter Bed – Stone _____ m_

Sand _____ m_

Pipe _____ m

Amount of Filter Media _____ Kg required

Pump(s) required _____

Specify discharge rate required _____ L/15min

Note: Alarm required for all pumping systems

SBT – Length of Distribution Pipe _____m

Area Bed – Stone _____ m_

Sand _____ m_

Pipe _____ m

Refer to Typical Drawing _____

Mantle Information

Native or (imported) –15m in 1(S) direction(s)

Slope subgrade 1 % slope

(S) direction(s)

Loading rate 324.38 m_ required

Construction Notes: _____

Ottawa Septic System Office | Bureau des systèmes septiques d'Ottawa

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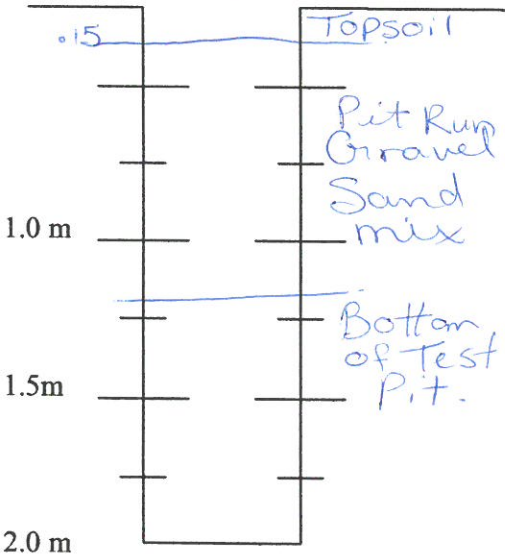
Revision No _____
Date _____

Schedule 6
Soil and Water Table Information
(Minimum depth of test pit: 2 metres)

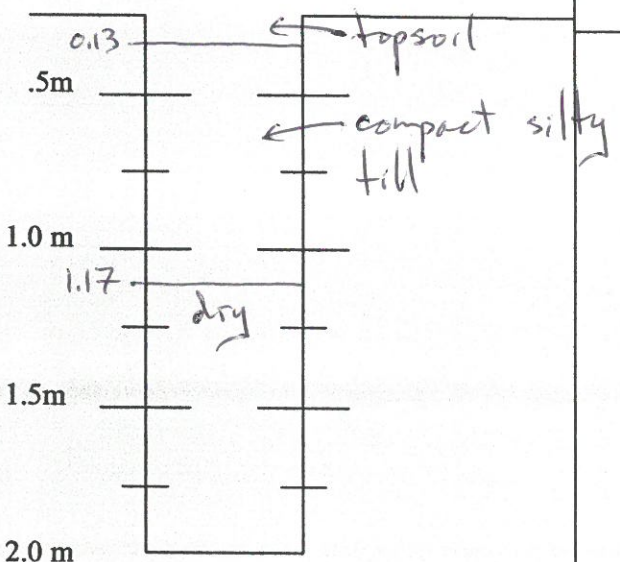
Name of Applicant/Agent: Latimer Excavating
Date: July 11-05 Time: P.M.
Applicant/Agent Signature: ~~Kate~~

Inspector: ACD
Date: Aug. 2/05 Time: 2:15
Inspector Signature: Ann Dill

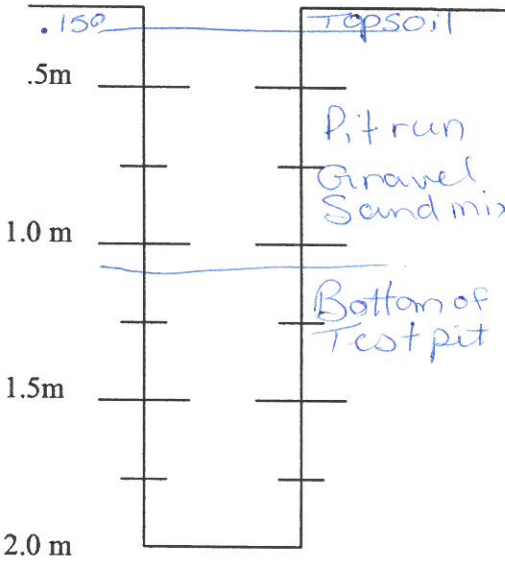
EG (98.26) Soil Description T



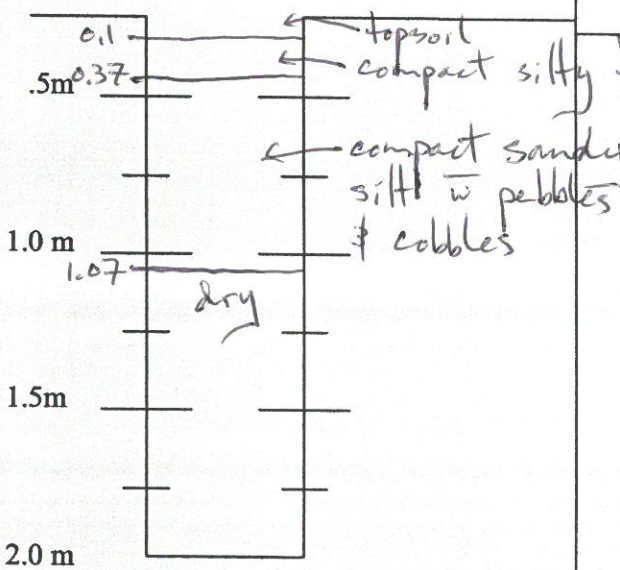
EG (98.39) Soil Description T



EG (95.74) Soil Description T



EG (95.788) Soil Description T



LEGEND

BR = Bedrock
GWT = Ground water table
HGWT = High ground water table
M = metres
EG = Existing grade
T = percolation rate

Ottawa Septic System Office / Bureau des systèmes septiques d'Ottawa

Do Not Complete
Permit No 05-493
Revision No
Date

Scale: ~~1Block~~ = 1:500

Schedule 7
Layout Section

N

See Attached Drawing

_Dug Well _Drilled Well _Neighbouring Homes ◊Benchmark ---Tile Drainage __Property Line

Elevations (metric only)
B.M 100.0 m
B.M Description Top of Foundation
Exact Location Top of Foundation under Door

Min. of 5 elevations in proposed system area (in X pattern)

X_1	98.60	X_2	97.40
X_3	95.30	X_4	95.74
X_5	98.26	X_6 (toe)	95.68
X_7		X_8	

Ottawa Septic System Office | Bureau des systèmes septiques d'Ottawa

Do Not Complete
Permit No 05-493
Revision No _____
Date _____

Schedule 8
Fixture unit count

Fixtures	# Existing	+	# Proposed	X	unit count	=	Fixture Count
Bathroom							
Bathroom group (toilet, sink and tub or shower) with flush tank		+		X	6	=	
Bathtub with/without overhead shower		+		X	1.5	=	
Shower stall		+		X	1.5	=	
Wash basin (1_inch trap)		+		X	1.5	=	
Watercloset (toilet) tank operated		+		X	4	=	
Bidet		+		X	1	=	
Kitchen							
Dishwasher		+		X	0.5	=	
Sink with/without garbage grinder(s), domestic and other small type single, double or 2 single with a common trap		+		X	1.5	=	
Other							
Domestic washing machine		+		X	1.5	=	
Combination sink and laundry tray single or double (Installed on 1_ trap)		+		X	1.5	=	
						Total:	

Insert the TOTAL in section 5 of Schedule 4 (0.Reb.403/97 Table 7.4.9.3)

1. Sump pumps and floor drains are not to be connected to the sewage system. Connection of such fixtures to a sewage system may lead to a hydraulic failure of the said system. The above mentioned fixtures should be discharged separately to an approved Class 2 (leaching pit) sewage system.
2. Where laundry waste is not more than 20% of the total daily design sanitary sewage flow, it may discharge to a sewage system (Part 8, OBC, 8.1.3.1(2)).

_____ _____

Agent/Owner signature Date

Ottawa Septic System Office
Bureau des systèmes septiques d'Ottawa

SCHEDULE 9 - TYPICAL DRAWING A

BURIED OR RAISED TILE BED - ABSORPTION TRENCH METHOD

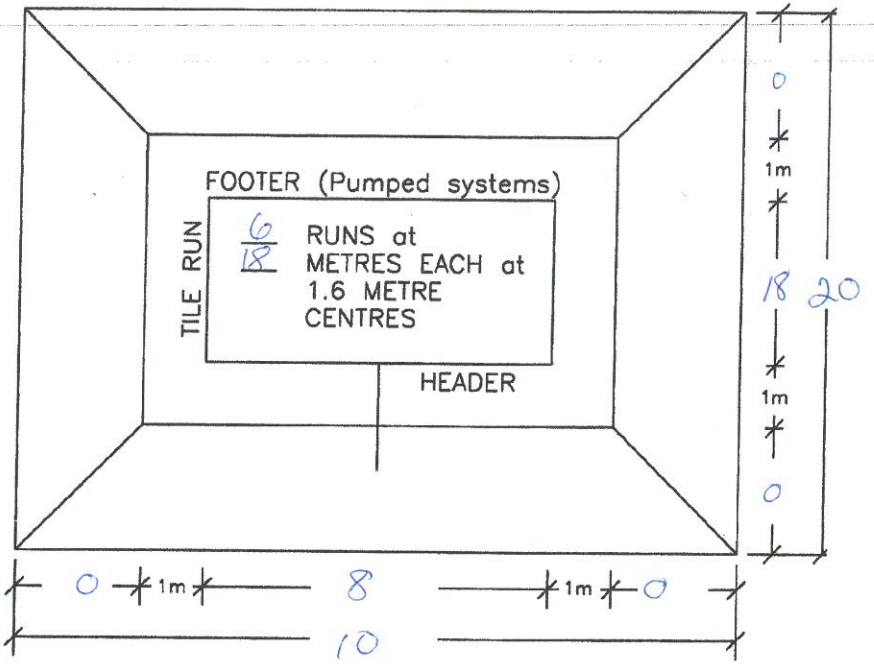
Septic Permit # 05-493
Date
Revision
Applicant
Municipality
Scarification required Yes [X] No [ ]

AUG 3/05 — DATE
MANAGER, O.S.S.O.

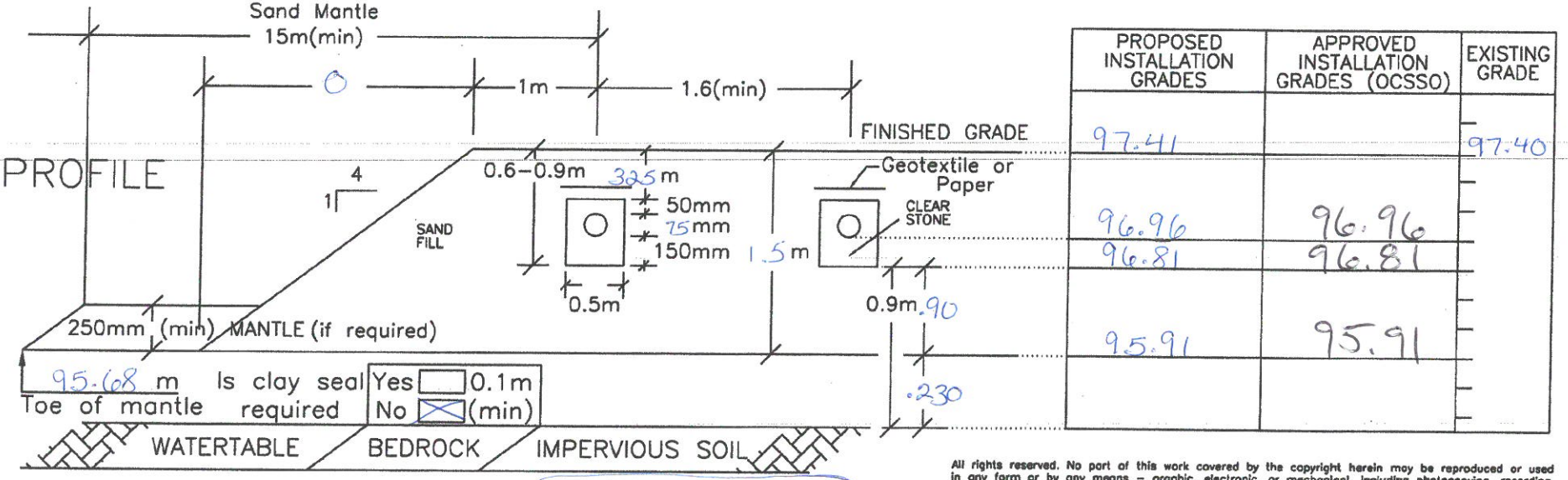
NOT TO SCALE

PLAN

Is mantle required:
Yes [X]
No [ ]
If Yes, in what direction 1 (S)



PROFILE



PROPOSED INSTALLATION GRADES	APPROVED INSTALLATION GRADES (OCSSO)	EXISTING GRADE
97.41		97.40
96.96	96.96	
96.81	96.81	
95.91	95.91	

SCARIFICATION REQUIRED
[X] yes

N

Scale: 1:500

05-493

Well for Shop Approx. 95m From Proposed Septic

Septic For Shop Approx. 75m From Proposed Septic

Shop (Existing) Building

111.49m

21m

4.56m

Storage Building (Existing)

4.35m

Asphalt Parking Area

116.05m

20m

Existing well for Office Building

Existing Showroom + Office Building

257.89m Property Line

7.18m

TKM AUG 3/05

Approx. 30m from Tank of Septic

6m

11m

21m

3m

7m

4m

X 98.60

TP X 98.26

X 97.40

X 95.74

TP 15m mantle

X 95.30

X 95.68

Approx. 40m

90.70m Driveway Entrance

Approx. Location of Septic For House

Existing 2 Storey House

16.49m

Existing well for 2 Storey House.

22.62m

73.60m

53m

Ditch

112.71m property Line

Ditch

2415 Carp Road.

Ottawa Septic System Office / Bureau des systèmes septiques d'Ottawa

Do Not Complete
Permit No 05-493
Revision No
Date

Permit

FOR OFFICE USE ONLY

Inspected and Recommended by ACD

Inspection Date (dd/mm/yyyy) and time: 02/08/05 Weather: Sun ~30°C

Representing Owner

Design T 8.3 min/cm Design HGWT / m

Percolation test required Yes/(No) Grain size analysis required Yes/(No)

Site to be Scarified (Yes)/No Clay Seal Inspection Yes/(No)

Mantle (Yes)/No

Septic/~~Holding~~ Tank 9500 L

Leaching Bed Design Criteria – Depth to rock/impervious soil ____ m

Requirements – Length of Distribution Pipe 108 m

Area Bed – Stone ____ m², Sand ____ m², Pipe ____ m

Shallow Buried Trench – Length of Pipe ____ m

Septic Tank Effluent Filter strongly recommended Amount of Filter Media / Kg required

Treatment Unit – Make and Model ____ Number of Units ____

Manager, Septic System Approvals: Jerry L Dawdy

Permit Issued Date: AUGUST 3, 2005

Permit ~~Revision~~

~~Revision~~ Description

① OSSO to inspect subgrade suitability prior to placing sand fill
② Septic system to be installed according to OBC.
③ Toe of mantle is to be free draining.

Manager, Septic System Approvals:

Revision Issued Date:

Ottawa Septic System Office | Bureau des systèmes septiques d'Ottawa

Installation Report • Rapport d'installation

Applicant: Lauryson Investments Inc Legal Description: Lot: ____ Conc.: ____ S.Lot: ____ R.Plan: ____

File #: 05-493 Present on site: ____ Inspector: Adam Dillon

Date: Aug. 16/05 Time: 10:30 Weather: sun ~30°C

Civic Address: 2415 Carp Rd.

Scarification Inspection and/or Clay Seal

Time: ____ Date: ____ Approved: ❑ yes ❑ no

Weather: ____ On-site: ____ Inspector: ____

Length: ____ Width: ____ Elevations: ____ Bed Area: ____

Comments: ____ Mantle ____

Section A Tank

Septic tank/holding tank size: 9400 (L) Filter make and model: OSI Biotube

Make and model: Boyd Bros. Inlet: sealed w glue Outlet: sealed

❑ plastic ☒ concrete ❑ fiberglass ❑ on-site ☒ prefabricated

Lids: recessed in concrete Baffles: pvc 'Ty'

Section B Treatment Unit

Make: ____ Connections: ____

Model: ____ Electrical: ____

Section C Leaching Bed

Location: front yard

Type: class 4 trench

Height: 70.9 m unsaturated sand

Header: ☒ level End Pipe: ☒ level

Runs: 6 Length: 18 m

Gravel Size: 3/4" Thickness: OK

Fall on Runs: ☒ yes ❑ no

Ends capped: ☒ yes ❑ no Interconnect ❑

Geotextile: ❑ yes ☒ no Paper: ❑ yes ❑ no

Pipes: Diameter ☒ 3 in. ❑ 4 in. ❑ chamber syst.

Make: ____

Extended base: ____

Paperwork for F.M.: ❑ grain size and C.U. ❑ Weigh Bills

Shallow Buried Trench: Runs: ____ Length: ____

Pipe: ❑ 1" ❑ 1.5" Chamber: ____

Distances:

~~Structure(s):~~ office ~~House:~~ 14 m

Lot Lines: >5.0m Wells*: 1) >18m

~~Watercourses:~~ 2) ____

Tree(s): maple, spruce, pine, poplar

Between Trenches: 1.6m

Mantles: 13.2 to 14.8 metres in 1 direction(s)

thickness: >0.25 m

Other: ____

Elevations: (if required)

Header: ____ Ends: ____

Area Bed:

Stone: Length: ____ Width: ____

Sand: Length: ____ Width: ____

Section D Pump Chamber

❑ pump chamber ❑ pump present

❑ floats installed ❑ electrical wiring

❑ alarm: ❑ inside ❑ outside

❑ joints sealed properly

❑ forced main: ❑ check valve ❑ frost protection installed

❑ other: ____

Section E Distribution Box

❑ sealed joints ❑ baffle or other

❑ level ❑ compacted base

❑ frost protection number of outlets: ____

Diagram:

*affected neighbouring wells

☒ Picture(s) taken

❑ Approved in Full

☒ Preliminary On-Site Approval (additional paperwork required, etc.)

❑ Not approved, for re-inspection, call 692-0160 or 1-800-459-5975. Please ensure that ALL noted deficiencies have been rectified prior to calling for a re-inspection.

Remarks:

① Geotextile to be placed over stone prior to backfilling.

② existing septic tank to be broken down / decommissioned.

③ 15m mantle required, check @ 3rd inspection

WHITE — OFFICE COPY • YELLOW — INSTALLER'S COPY

Ottawa Septic System Office
Bureau des systèmes septiques d'Ottawa

SEPTIC REMOVAL PERMIT # 05-493

REQUIRED FOR ALL INQUIRIES

AS-BUILT DRAWING

(required prior to installation inspection)

Elevations of installed system must be supplied with this report (in reference to the TBM).
Exact size and location of all structures, well(s) and system(s) and its components must be shown (including neighbouring lots).

Septic/Holding Tank: 9400 L
Manufacturer: Boyd Bros.
☒ concrete ☐ polyethylene ☐ other
Filter: ☐ no ☒ yes Orenco make
Treatment: Make
Unit: Model
Diameter of pipes 3 mm (inches)
Make of pipes: Ipex
Ends: ☒ capped ☐ interconnected
Number of runs: 6 Runs m
Length of runs: 18 m

Filter media:
Amount Purchased: kg
Date Purchased:
Supplier:
Grain/size analysis by:
Analysis dated:

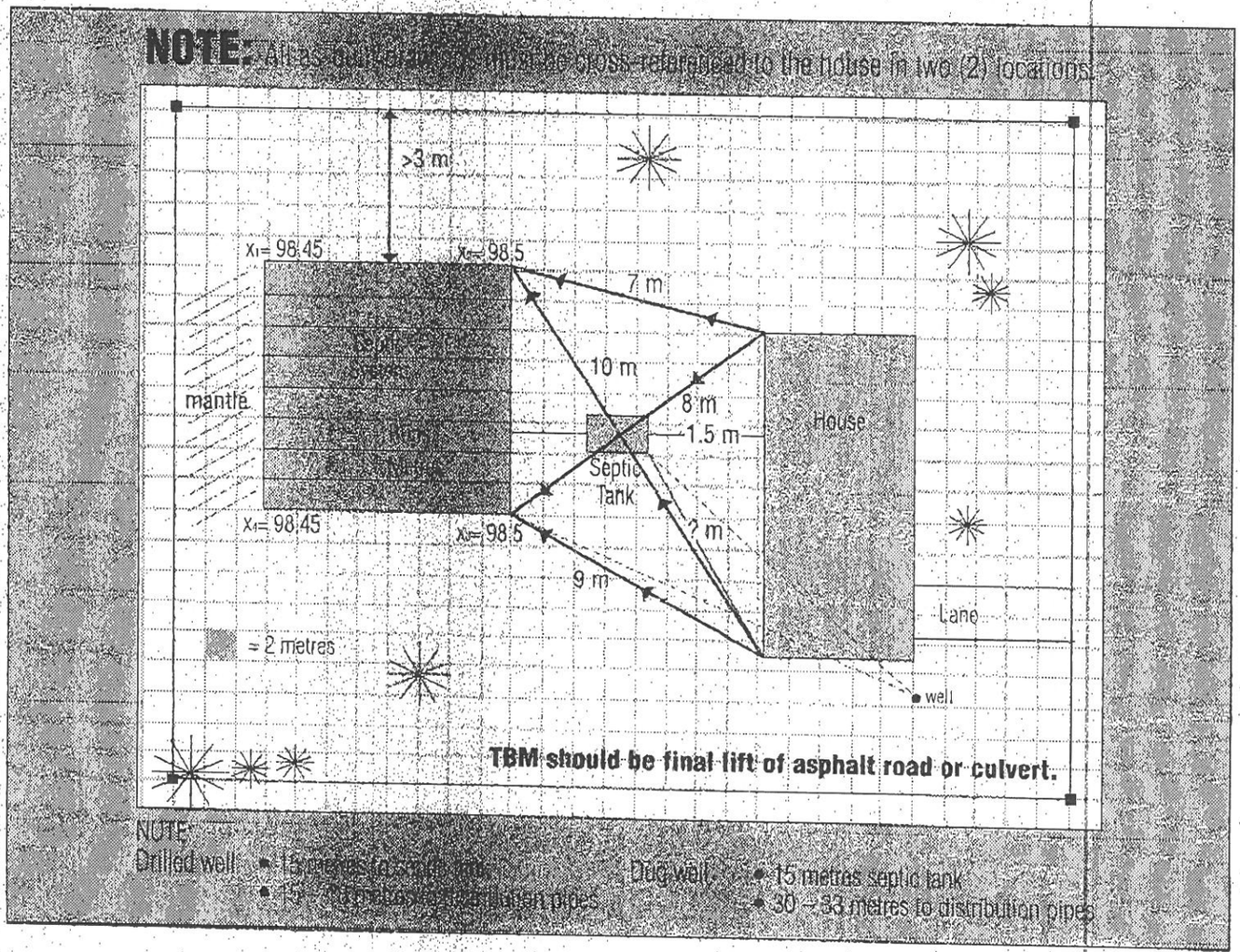
Name of owner: Laurysen Investments Inc.
Installer: Latimer Excavating Ltd.
Installer Signature: Lati
License Number: 16516
Date of Installation: August 11, 2005
Civic Address or Legal Description of Property:
2415 Carp Rd.
Township West CARLETON (Huntley)

Pump Systems:
Volume discharge rates: /15min
Alarm location:
Dimension of Pump Chamber:
Height of Float Switch:

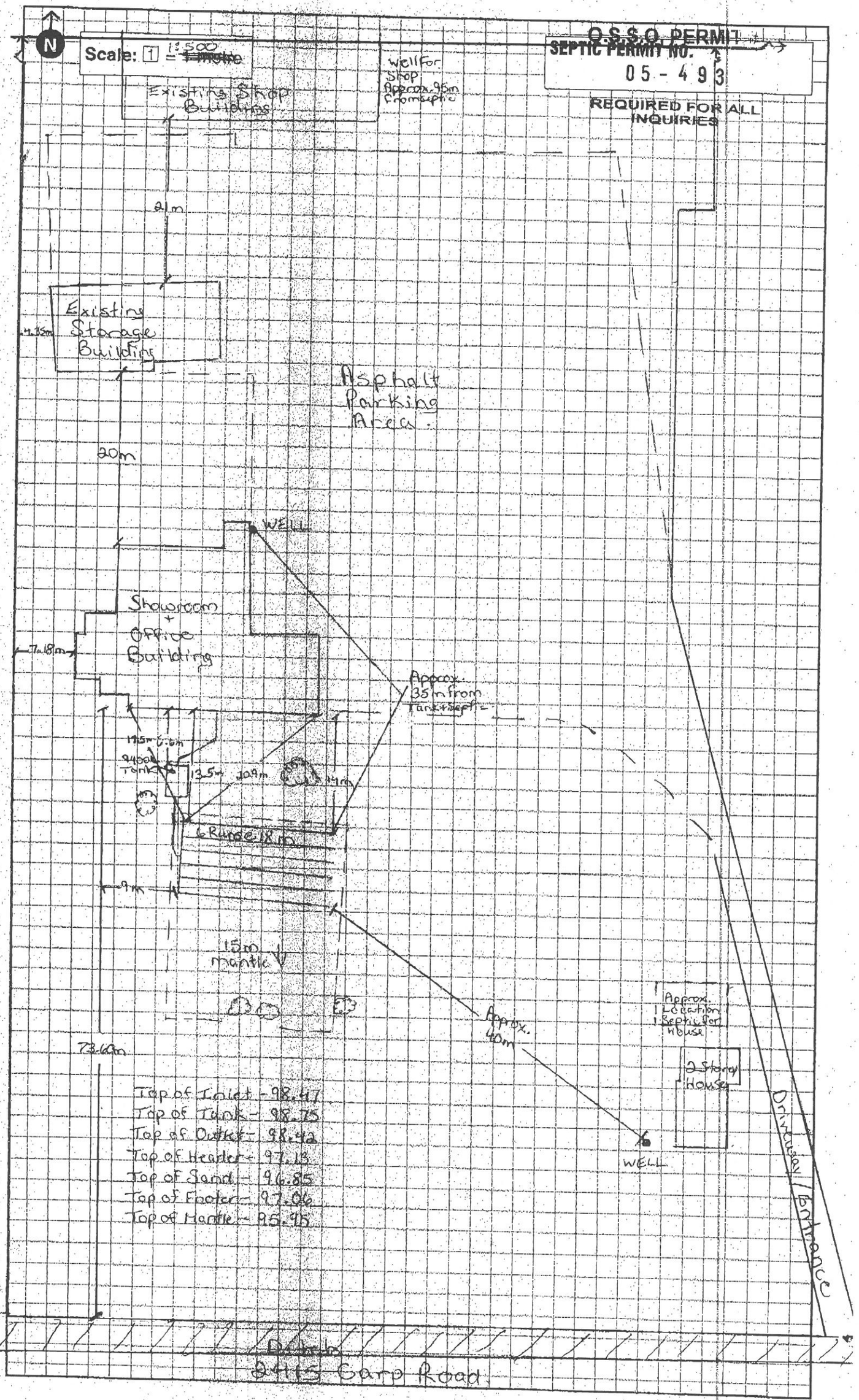
Grease Interceptor:
☐ no ☐ yes Size:
Location:

***Grain Size Analysis and weight bills must be supplied with this report.**

NOTE: All as-built drawings must be cross-referenced to the house in two (2) locations.



NOTE:
Drilled well: • 15 metres to septic tank
• 15 – 30 metres to distribution pipes
Dug well: • 15 metres septic tank
• 30 – 33 metres to distribution pipes


N
Scale: 1 = 1:500 ~~1 metre~~
O.S.S.O. PERMIT
SEPTIC PERMIT NO.
05 - 493
REQUIRED FOR ALL INQUIRIES
well for Shop Approx. 95m from septic
Existing Shop Building
21m
Existing Storage Building
4.35m
Asphalt Parking Areas
20m
WELL
Showroom + Office Building
7.18m
Approx. 35m from Tank
1.5m
2.0m
9400L Tank
3.5m
10.9m
14m
leRunoff 18m
9m
15m mantle
Approx. 40m
Approx. Location Septic for House
2 Storey House
WELL
Driveway / Entrance
Top of Inlet - 98.47
Top of Tank - 98.75
Top of Outlet - 98.42
Top of Header - 97.13
Top of Sand - 96.85
Top of Footer - 97.06
Top of Mantle - 95.95
Dirt Rd.
8415 Carp Road

Ottawa Septic System Office | Bureau des systèmes septiques d'Ottawa

Final Grading Inspection

File #: 05-493 Lot Ident: _____ Applicant: Lauryson Investments Inc.

Lot Identification _____ Date: Sept. 1/05 Time: ~2:20 Weather: sun

Present on Site: Julie Lyons Inspector: Adam Dillon / TKD

Civic Address: 2415 Carp Rd.

1) Depth of cover material measured from the top of the crushed stone layer to surface.

X_1= 0.82 m 0.58 m X_2= 0.78 m 0.70m X_3= 0.65 m Sept 14/05 JPA X_4= _____ m → 0.48m X_5= _____ m 0.42m

2) Description of cover material: ☒ sand

☒ topsoil

☐ seed/sod

3) Is the top of the bed shaped to shed water? ☒ yes ☐ no

4) Is the side slope stable? ☒ yes ☐ no

5) Is all drainage directed away from the tile bed? ☒ yes ☒ no Sept 14/05 JPA

6) Thickness of Mantle:

L_1= _____ m L_2= _____ m L_3= _____ m L_4= _____ m

7) Depth of mantle _____ (metres) ☐ yes ☐ no

8) Description of mantle material: _____

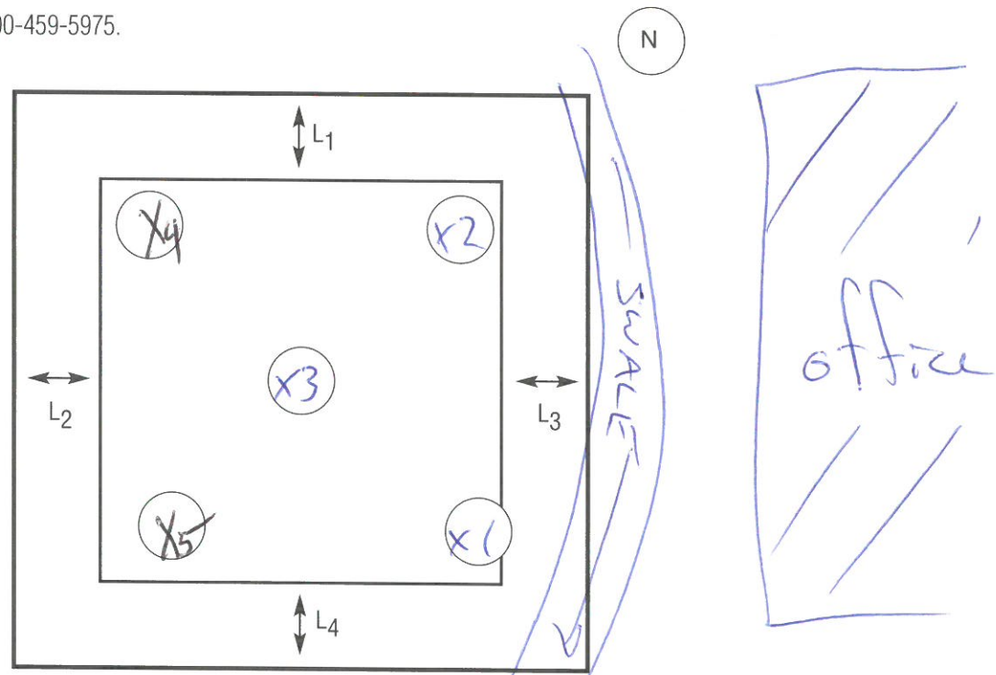
9) Was a photograph of the complete system taken? ☐ yes ☒ no

10) Inspection ☒ approved in full Sept 14/05 JPA

☐ conditional approval (see comments:)

☒ not approved (see comments:)

For re-inspection, call 692-0160 or 1 800-459-5975.



11) Comments:

- remove soil cover & construct swale to direct surface water away ⇒ OK Sept 14/05 JPA from septic bed.

* 0.70m final cover in area of X_2 exceeds maximum of 0.60m, but will be overlooked since drainage swale is in place to direct surface runoff away from bed.

JIM GRANT

Ottawa Septic System Office | Bureau des systèmes septiques d'Ottawa

Certificate of Completion

For the use and operation of an on-site sewage disposal system in accordance with the **Sewage System Permit**.
This certifies that the on-site sewage system conforms to the *Ontario Building Code* and Ontario Regulation 403/97 as amended by Ontario Regulation 22/98

Sewage System Permit Number 05-493 | **Issued to** Laurysen Investments Inc

Legal Description | Lot 5 | Concession 3 | Sub. Lot | Registered/Reference Plan 5R-11322

Municipal Address: 2415 Carp Rd

In the former Township/~~City~~ of Huntley | Within the City of Ottawa

Details Pertaining to System

☐ new installation ☒ replacement ☐ alteration

a) Type of System: Class 4 sewage system ☒ trench ☐ filter media ☐ SBT ☐ area bed ☐ other

b) ☒ New ☐ Existing septic tank/~~holding tank~~ with a working capacity of 9400 litres constructed of ☒ concrete ☐ fibreglass ☐ plastic

c) ☒ Trench ☐ Filter Media Leaching bed of total 108 metres of [76 (mm) diameter pipe, or _____ chambers] laid in 6 runs at 18 metres and fed by ☒ gravity ☐ siphon ☐ pump

d) Shallow Buried Trench ____ metres of ____ millimetre diameter distribution pipe laid in _____ runs at _____ metres

e) Area Bed: _____ Stone m^2 Sand _____ m^2 Pipe _____ metres fed by ☐ gravity ☐ pump

f) Effluent Filter: Manufacturer ORENCO Model OSI Biotube

g) Sewage Treatment Unit(s): Manufacturer _____ Model _____

h) Other _____

Certificate Issued By:

Director of Regulations
Ottawa Septic System Office Terry L Davidson Date Issued SEPTEMBER 19, 2005

McINTOSH PERRY
Consulting Engineers Ltd.
115 Walgreen Rd., R.R.3 Carp, ON K0A 1L0
Tel.: (613) 836-2184 Fax: (613) 836-3742

August 29, 2005

VIA FACSIMILE
(613) 692-0831

Ottawa Septic Systems Office
1127 Mill Street
P.O. Box 599
Manotick, Ontario
K4M 1A5

Attention: Terry Davidson, Director of Regulations

RE: Laurysen Investments Inc.
Permit No. 05-493

During a site inspection on August 26, 2005, it was confirmed that the depth of cover over the top of the crushed stone layer was in excess of 0.6m for one of the tile runs. Thus, it was recommended that some of the cover material be removed. A second site inspection was completed on August 29, 2005 and it was confirmed that the depth of cover had been reduced to approximately 0.6m over the septic bed tile runs.

Furthermore, additional test pits were dug at the end of the 14.3m mantle to determine the content of the existing soil. The test pits revealed a sandy soil, which would be adequate mantle material. It is McIntosh Perry Consulting Engineers Ltd. recommendation that the mantle consist of both native and imported material. Therefore, the 15m mantle would extend into the native material to a depth of 0.25m.

If you have any questions, please do not hesitate to contact the undersigned.

Yours truly,

Lisa Marshall, B.Eng.
Ext. 24

C.C. Adam Dillion, Inspector
Ivan Latimer, Latimer Excavating (Fax 836-4117)

P04-154-Kitchen Septic Letter.Aug29.05

McINTOSH PERRY Consulting Engineers Ltd.
115 Walgreen Road Carp, ON K0A1L0
Tel.: (613) 836-2184 Fax: (613) 836-3742

September 1, 2005

The Ottawa Septic System Office
1127 Mill Street
Manotick, Ontario
K4M 1A5
Fax: (613) 692-0831

VIA FACSIMILE

Attention: Terry Davidson
Director of Regulations

FILE NO. 05-493 – LAURYSEN INVESTMENTS INC.
ONSITE SEWAGE DISPOSAL SYSTEM
RESCIND BED INSTALLATION COMMENT

This letter is written after a site meeting with the Ottawa Septic System Office on September 1, 2005, and the subsequent inspection at the above noted location. It was found after further inspection, conducted by both representatives from McIntosh Perry and the Septic Office, Julie Lyons and Adam Dillon respectively, that the cover material was in excess of Ontario Building Code requirements. Please rescind the letter received from our office dated September 1, 2005, titled 'Bed Installation Comment', and stamped by Julie Lyons, P.Eng. It is agreed that additional material needs to be removed from the top of the tile bed area to meet OBC requirements.

If you have any questions or comments regarding the above, please contact Lisa Marshall at ext. 24, or the undersigned.

Yours truly,

Julie Lyons

Julie Lyons, P.Eng.
Ext. 25

P05-154 Laurysen Septic Comment.Aug31.2005.doc
cc: Ivan Latimer, Latimer Excavating
Adam Dillon, Inspector

McINTOSH PERRY
Consulting Engineers Ltd.
115 Walgreen Road Carp, ON K0A1L0
Tel.: (613) 836-2184 Fax: (613) 836-3742

September 1, 2005

The Ottawa Septic System Office
1127 Mill Street
Manotick, Ontario
K4M 1A5
Fax: (613) 692-0831

VIA FACSIMILE

Attention: Terry Davidson
Director of Regulations

FILE NO. 05-493 – LAURYSEN INVESTMENTS INC.
ONSITE SEWAGE DISPOSAL SYSTEM
BED INSTALLATION COMMENT

This letter is written to comment on the suitability of the septic system installation at the above noted property. In a previous letter from McIntosh Perry Consulting Engineers (MPCE), dated August 29, 2005, it was stated that the depth of cover over the tile bed area had been reduced to approximately 0.6m. The letter also stated that a 15m mantle, with a depth of 0.25m, was in place.

The Ottawa Septic System Office (OSSO) conducted an additional inspection after receipt of our letter. McIntosh Perry then conducted a third site inspection. The following observations were noted in response to the inspection report dated August 30, 2005.

1. Depth of cover at locations x1 and x2 were 0.7m and 0.56m respectively. It should be noted that the cover material in place consists of sand and topsoil, thus it should not increase. Settlement of the cover material will also take place with time, further reducing the depth of cover. The 0.075m additional cover (75mm tile) at x1 should not affect evapo-transpiration and root uptake and the proper functioning of the tile bed.
2. As noted in the OSSO inspection report dated August 30, 2005, depth of cover at locations x3 and x4 are less than at locations x1 and x2, thus the top of the bed is sloped to shed surface water towards the mantle area. McIntosh Perry inspected the bed Wednesday, August 31, 2005 after a heavy rainfall and no surface ponding was evident. Thus it would seem the swale indicated on the OSSO inspection

Appendix 3

Proposed Septic Permit

Rideau Valley Conservation Authority

Application for a Permit to Construct or Demolish

This form is authorized under subsection 8(1.1) of the *Building Code Act, 1992*

For use by Principal Authority	
Application number:	Permit number (if different):
Date received:	Roll number:

Application submitted to: _____
(Name of municipality, upper-tier municipality, board of health or conservation authority)

A. Project information

Building number, street name		Unit number	Lot/con.
2413 Carp Rd.			
Municipality	**Postal code**	**Plan number/other description**	
Ottawa	K0A 1L0	5R-11332	
Project value est. $		**Area of work (m^2)**	
20000		80	

B. Purpose of application

☑ New construction ☐ Addition to an existing building ☐ Alteration/repair ☐ Demolition ☐ Conditional Permit

Proposed use of building	Current use of building
Maintenance Garage	N/A

RVCA RECEIVED
DEC 2 2 2025
REFER TO: _____

Description of proposed work
Installation of a new septic system for a new maintenance garage

C. Applicant

Applicant is: ☐ Owner or ☑ Authorized agent of owner

Last name	First name	Corporation or partnership	
Burtt	Evan	Taskforce Engineering Inc.	
Street address		**Unit number**	**Lot/con.**
24 Newberry St		201	
Municipality	**Postal code**	**Province**	**E-mail**
Belleville	K8N3N3	ON	eburtt@taskforce-eng.com
Telephone number	**Fax**		**Cell number**
613-966-5600			343-645-4609

D. Owner (if different from applicant)

Last name	First name	Corporation or partnership	
		Waste Management of Canada Corp.	
Street address		**Unit number**	**Lot/con.**
117 Wentworth Court			
Municipality	**Postal code**	**Province**	**E-mail**
Brampton	L6T 5L4	ON	rgodin@wm.com
Telephone number	**Fax**		**Cell number**

E. Builder (optional)

Last name	First name	Corporation or partnership (if applicable)	
Street address		Unit number	Lot/con.
Municipality	Postal code	Province	E-mail
Telephone number	Fax	Cell number	

F. Tarion Warranty Corporation (Ontario New Home Warranty Program)

i. Is proposed construction for a new home as defined in the *Ontario New Home Warranties Plan Act*? If no, go to section G.	☐ Yes	☑ No
ii. Is registration required under the *Ontario New Home Warranties Plan Act*?	☐ Yes	☑ No

iii. If yes to (ii) provide registration number(s): _____

G. Required Schedules

i) Attach Schedule 1 for each individual who reviews and takes responsibility for design activities.

ii) Attach Schedule 2 where application is to construct on-site, install or repair a sewage system.

H. Completeness and compliance with applicable law

i) This application meets all the requirements of clauses 1.3.1.3 (5) (a) to (d) of Division C of the Building Code (the application is made in the correct form and by the owner or authorized agent, all applicable fields have been completed on the application and required schedules, and all required schedules are submitted).	☑ Yes	☐ No
Payment has been made of all fees that are required, under the applicable by-law, resolution or regulation made under clause 7(1)(c) of the *Building Code Act, 1992*, to be paid when the application is made.	☑ Yes	☐ No
ii) This application is accompanied by the plans and specifications prescribed by the applicable by-law, resolution or regulation made under clause 7(1)(b) of the *Building Code Act, 1992*.	☑ Yes	☐ No
iii) This application is accompanied by the information and documents prescribed by the applicable by-law, resolution or regulation made under clause 7(1)(b) of the *Building Code Act, 1992* which enable the chief building official to determine whether the proposed building, construction or demolition will contravene any applicable law.	☑ Yes	☐ No
iv) The proposed building, construction or demolition will not contravene any applicable law.	☑ Yes	☐ No

I. Declaration of applicant

I Evan Burtt declare that:
(print name)

1. The information contained in this application, attached schedules, attached plans and specifications, and other attached documentation is true to the best of my knowledge.
2. If the owner is a corporation or partnership, I have the authority to bind the corporation or partnership.

December 2, 2025 — Date

Evan Burtt — Signature of applicant

Digitally signed by Evan Burtt
Date: 2025.12.02 10:17:10-05'00'

Personal information contained in this form and schedules is collected under the authority of subsection 8(1.1) of the *Building Code Act, 1992*, and will be used in the administration and enforcement of the *Building Code Act, 1992*. Questions about the collection of personal information may be addressed to: a) the Chief Building Official of the municipality or upper-tier municipality to which this application is being made, or, b) the inspector having the powers and duties of a chief building official in relation to sewage systems or plumbing for an upper-tier municipality, board of health or conservation authority to whom this application is made, or, c) Director, Building and Development Branch, Ministry of Municipal Affairs and Housing 777 Bay St., 2nd Floor. Toronto, M5G 2E5 (416) 585-6666.

RVCA RECEIVED
DEC 22 2025
REFER TO: _____

Rideau Valley Conservation Authority

Schedule 1: Designer Information

Use one form for each individual who reviews and takes responsibility for design activities with respect to the project.

A. Project Information

Building number, street name		Unit no.	Lot/con.
2413 Carp Rd.			
Municipality	**Postal code**	**Plan number/ other description**	
Ottawa	K0A 1L0	5R11332	

B. Individual who reviews and takes responsibility for design activities

Name		Firm	
Evan Burtt		Taskforce Engineering Inc.	
Street address		**Unit no.**	**Lot/con.**
24 Newberry St.		201	
Municipality	**Postal code**	**Province**	**E-mail**
Belleville	K8N3N3	ON	eburtt@taskforce-eng.com
Telephone number	**Fax number**		**Cell number**
613-966-5600			

C. Design activities undertaken by individual identified in Section B. [Building Code Table 3.5.2.1. of Division C]

☐ House	☐ HVAC – House	☐ Building Structural
☐ Small Buildings	☐ Building Services	☐ Plumbing – House
☐ Large Buildings	☐ Detection, Lighting and Power	☐ Plumbing – All Buildings
☐ Complex Buildings	☐ Fire Protection	☑ On-site Sewage Systems

Description of designer's work: Septic System Design

D. Declaration of Designer

I Evan Burtt declare that (choose one as appropriate):

(print name)

I review and take responsibility for the design work on behalf of a firm registered under subsection 3.2.4.of Division C, of the Building Code. I am qualified, and the firm is registered, in the appropriate classes/categories.

Individual BCIN: _____

Firm BCIN: _____

I review and take responsibility for the design and am qualified in the appropriate category as an "other designer" under subsection 3.2.5.of Division C, of the Building Code.

Individual BCIN: _____

Basis for exemption from registration: _____

The design work is exempt from the registration and qualification requirements of the Building Code.

Basis for exemption from registration and qualification: Designer is P.Eng.

I certify that:

1. The information contained in this schedule is true to the best of my knowledge.
2. I have submitted this application with the knowledge and consent of the firm.

October 2, 2025 (Date)

Evan Burtt (Signature of Designer)

Digitally signed by Evan Burtt
Date: 2025.10.02 17:09:57-04'00'

NOTE:

1. For the purposes of this form, "individual" means the "person" referred to in Clause 3.2.4.7(1) (c).of Division C, Article 3.2.5.1. of Division C, and all other persons who are exempt from qualification under Subsections 3.2.4. and 3.2.5. of Division C.
2. Schedule 1 is not required to be completed by a holder of a license, temporary license, or a certificate of practice, issued by the Ontario Association of Architects. Schedule 1 is also not required to be completed by a holder of a license to practise, a limited license to practise, or a certificate of authorization, issued by the Association of Professional Engineers of Ontario.

RVCA RECEIVED
DEC 2 2 2025
REFER TO: _____

Rideau Valley Conservation Authority

Schedule 2: Sewage System Installer Information

A. Project Information			
Building number, street name		Unit number	Lot/con.
Municipality	Postal code	Plan number/ other description	

B. Sewage system installer

Is the installer of the sewage system engaged in the business of constructing on-site, installing, repairing, servicing, cleaning or emptying sewage systems, in accordance with Building Code Article 3.3.1.1, Division C?

☐ Yes (Continue to Section C) ☐ No (Continue to Section E) ☑ Installer unknown at time of application (Continue to Section E)

C. Registered installer information (where answer to B is "Yes")			
Name			BCIN
Street address			Unit number / Lot/con.
Municipality	Postal code	Province	E-mail
Telephone number	Fax		Cell number

D. Qualified supervisor information (where answer to section B is "Yes")	
Name of qualified supervisor(s)	Building Code Identification Number (BCIN)

E. Declaration of Applicant:

I Evan Burtt (print name) declare that:

I am the applicant for the permit to construct the sewage system. If the installer is unknown at time of application, I shall submit a new Schedule 2 prior to construction when the installer is known;

OR

I am the holder of the permit to construct the sewage system, and am submitting a new Schedule 2, now that the installer is known.

I certify that:

1. The information contained in this schedule is true to the best of my knowledge.
2. If the owner is a corporation or partnership, I have the authority to bind the corporation or partnership.

October 2, 2025 (Date) — Evan Burtt (Signature of applicant) — Digitally signed by Evan Burtt Date: 2025.10.02 17:08:20-04'00'

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DEC 2 2 2025
REFER TO:

Rideau Valley Conservation Authority

Schedule 4: Proposed Services

Complete Sections ❶ **through** ❼

Do Not Complete		
Permit number:	Revision number:	Date

❶ Engineered
- ☒ Yes
- ☐ No

❷ Water supply
- ☐ Proposed
- ☒ Existing

❸ Use
- ☐ Apartment
- ☐ Dwelling
- ☐ Commercial
- ☒ Industrial

❹ Type of work proposed
- ☒ New Installation
- ☐ Replacement
- ☐ Alteration

❺ Type of Well
- ☐ Dug/Bored/Sandpoint well
- ☒ Drilled well
- ☐ Municipal
- ☐ Other

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DEC 2 2 2025
REFER TO: _____

❻ Residential Sewage Design Flow Info.

Bedrooms _____

House (floor area) _____ m^2

People _____

Total Fixture Units _____ (Schedule 8)

Residential Flow _____ L/day

❼ Sewage Design Flow Other Occupancies

Design Flow 2,102.4 L/day

Detailed sewage flow calculations:

186.3 m2 office area @ 75L/9.3m2

4 doors @ 150 L/door

❽ Type of System

- ☐ Class 2 – Leaching Pit
- ☐ Class 3 – Cesspool

Treatment Unit Eljen GSF

- ☐ **Class 4 – Trench** (Schedule 9)
  - ☐ Fully raised
  - ☐ Partially raised
  - ☐ In-ground
- ☒ **Class 4 – Filter Media** (Schedule 10)
  - ☐ Fully raised
  - ☐ Partially raised
  - ☒ In-ground
- ☐ **Class 4 – Shallow Buried Trench**
  - ☐ Fully raised
  - ☐ Partially raised
  - ☐ In-ground
- ☐ **Class 4 – BMEC Area Bed** (Schedule 11)
  - ☐ Fully raised
  - ☐ Partially raised
  - ☐ In-ground
- ☐ **Class 4 – "Type A" Dispersal** (Schedule 13)
  - ☐ Fully raised
  - ☐ Partially raised
  - ☐ In-ground
- ☐ **Class 4 – "Type B" Dispersal** (Schedule 14)
  - ☐ Fully raised
  - ☐ Partially raised
  - ☐ In-ground
- ☐ **Class 5 – Holding Tank** (9000L min)
- ☐ Tank/TreatmentUnit/PumpChamber ONLY
- ☐ Effluent Filter/Risers ONLY
- ☐ Other _____

Rideau Valley Conservation Authority

Schedule 5: Sewage System Details

RVCA RECEIVED
DEC 2 2 2025
REFER TO:

Do Not Complete

Permit number:	Revision number:	Date

Complete below

Type of System Class 4 with Eljen GSF Modules (Schedule 4)

Septic/Holding Tank Size: 7,048 (Litres) Make: Unknown

Septic Tank Effluent Filter Make: N/A Model: Unknown

Treatment Unit - Make & Model: Eljen GSF Module

Number of Units: 24

Refer to Typical Drawing #: A.1a Servicing Plan

Pump ☐ Syphon ■

Pump(s) required: _____

Pump Rate: _____ L/15min

Mantle Information

Native or imported=min. 15m in _____ direction(s)

Slope subgrade 0.5 % slope

All direction(s)

Note: Alarm required for all pumping systems

Installed ☐ Inside

☐ Outside

Site to be Scarified (If clay) Yes ☐ No ■ Clay Seal Required (If bedrock) Yes ☐ No ☐

☐ **Trench**

Distribution Pipe Length _____ m

Loading Area _____ m^2

Type of Chamber _____

Length of Chamber _____ m

■ **Dispersal Bed**

☐ **BMEC** ☐ **Type A** ☐ **Type B**

Stone _____ m^2

Sand _____ m^2

Pipe _____ m^2

Linear Loading _____ L/m^2

☐ **Shallow Buried Trench**

Pipe Length _____ m^2

Pipe _____

☐ **Filter Media Bed**

Stone _____ m^2

Extended Base _____ m^2

Pipe _____

Weight of Filter Media _____ Kg

Loading Area _____ m^2

☐ Tank/Treatment Unit/Pump Chamber Replacement **ONLY**

☐ Effluent Filter & Riser **ONLY**

Construction Notes:

This is an Eljen GSF Module system. It consists of a traditional septic tank, with geotextile sand modules in lieu of normal distribution piping. Number of modules are based on Q/95, number required are 16, we are proposing 18. The filter bed required (QT/400) is 37.6m2. We are proposing 52.3 m2. Details on the design are found on Drawing A.1a Servicing Plan & Septic Details.

Rideau Valley Conservation Authority

Schedule 6: Soil and Water Table Information (Minimum depth of test pit: 2 metres)

Do Not Complete		
Permit number:	Revision number:	Date

Name of Applicant/Agent: _____
Date: _____ Time: _____
Applicant/Agent Signiture: _____

Inspector: _____
Date: _____ Time: _____
Inspector Signiture: _____

EG (_____) **Soil Description**

___ m
___ m
___ m
___ m
___ m
___ m

T-time _____ Min/cm

See included geotechnical report with borehole information

EG (_____) **Soil Description**

___ m
___ m
___ m
___ m
___ m
___ m

T-time _____ Min/cm

EG (_____) **Soil Description**

___ m
___ m
___ m
___ m
___ m
___ m

T-time _____ Min/cm

EG (_____) **Soil Description**

___ m
___ m
___ m
___ m
___ m
___ m

T-time _____ Min/cm

Legend

BR	Bedrock
HGWT	High ground water table
EG	Existing grade
GWT	Ground water table
M	metres
T	percolation rate

Rideau Valley Conservation Authority

Schedule 7: Layout Section

Do Not Complete		
Permit number:	Revision number:	Date

Scale: 1 Block = _____

O Dug Well
● Drilled Well
▲ Neighbouring Homes
◇ Benchmark
----- Tile Drainage
___ Property Line

See included site plan drawings A.1 Site Plan & Details and A.1a Servicing Plan & Septic Details

Elevations (metric only)

B.M. _____ m

B.M Description _____

_____

Exact Loaction _____

Min. of 5 elevations in proposed system area (in X pattern)

X_1 _____ X_2 _____

X_3 _____ X_4 _____

X_5 _____ X_6 (toe) _____

X_7 _____ X_8 _____

Rideau Valley Conservation Authority

Schedule 8: Fixture unit count

Do Not Complete		
Permit number:	Revision number:	Date

Fixtures	# Existing	+	# Proposed	X	unit count	=	Fixture Count
Bathroom							
Bathroom group (toilet, sink and tub or shower) installed in the **same room**		+		X	6	=	0
Bathtub with/without overhead shower		+		X	1.5	=	0
Shower stall		+		X	1.5	=	0
Wash basin (SINK) (1½ inch trap)		+		X	1.5	=	0
Watercloset (TOILET) tank operated		+		X	4	=	0
Bidet		+		X	1	=	0
Kitchen							
Dishwasher		+		X	1	=	0
Sink with/without garbage grinder(s), domestic and other small type single, double or 2 single with a common trap		+		X	1.5	=	0
Other							
Domestic washing machine		+		X	1.5	=	0
Combination sink and laundry tray single or double (Installed on 1½ trap)		+		X	1.5	=	0
					Total*	=	0

***Insert the TOTAL in Section 6 of Schedule 4 (0.Reg 151/13 Table 7.4.9.3)**

1. Sump pumps and floor drains are not to be connected to the sewage system. Connection of such fixtures to a sewage system may lead to a hydraulic failure of the said system. The above mentioned fixtures should be discharged separately to an approved Class 2 (leaching pit) sewage system.

2. Where laundry waste is not more than 20% of the total daily design sanitary sewage flow, it may discharge to a sewage system (Part 8, OBC, 8.1.3.1(2)).

Evan Burtt Digitally signed by Evan Burtt Date: 2025.12.02 10:19:09-05'00'

Agent/Owner signature

December 2, 2025

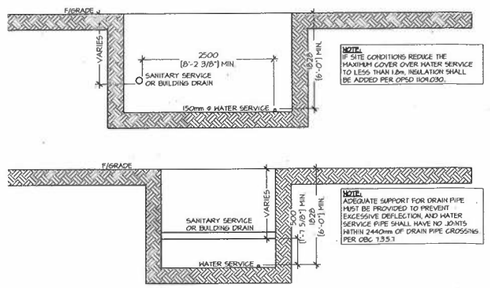
Date

RVCA RECEIVED
DEC 2 2 2025
REFER TO: _____

SITE STATISTICS:

ZONED :	RH Zone
MIN. PROPERTY AREA :	8,000 s.m.
PROPERTY AREA :	41,188 s.m.
NEW FACILITY AREA :	1,027 s.m.
EXISTING FACILITY AREA :	5,604 s.m.
TOTAL FACILITY AREA:	6,631 s.m.
LOT COVERAGE:	16.0 %
MAX LOT COVERAGE:	50 %
NEW BUILDING HEIGHT :	10.6 m.
MAX BUILDING HEIGHT :	15 m.
No. OF STOREYS :	-1-
MIN. FRONT YARD SETBACK :	15 m.
BLDG. FRONT SETBACK:	301.5 m.
MIN. INTERIOR SIDEYARD SETBACK :	3 m.
BLDG. MIN. INTERIOR SIDEYARD SETBACK:	4.9 m.
MIN. REAR YARD SETBACK :	15 m.
BLDG. REAR SETBACK:	175.5 m.
No. OF PROPOSED PARKING SPACES Shown :	9 SP.
No. OF BARRIER-FREE SPACES : INCL. :	1 SP.
No. OF REQUIRED PARKING SPACES	
0.75/100m2 HEAVY EQUIP.SERVICE:	8 SP.
0.8/100m2 LIGHT INDUSTRIAL EXISTING:	39 SP.
TYPICAL PARKING WIDTH	2.8 m.
TYPICAL PARKING LENGTH	6.0 m.

SITE BENCHMARKS:
VERTICAL: COSINE STATION 0011970U242 = 114.689 m.
HORIZONTAL: NAD83-CSRS (ZONE 18) EPOCH 2010

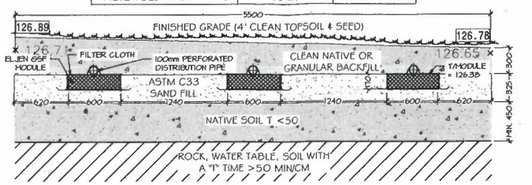


SERVICE CROSSING DETAIL
SCALE = 1:50

SITE LEGEND:

+ 00.00	- EXIST. GRADE ELEVATION
00.00	- PROPOSED GRADE ELEVATION
(00.00)	- PROPOSED DITCH ELEVATION
	- FLOW / DIRECTION
H	- HYDRO
STM	- STORM PIPE
SAN	- SANITARY PIPE
W	- WATER LINE
G	- GAS LINE
B	- BELL LINE
X	- FENCE
M.H.	- MAN HOLE
H.P.	- HYDRO POLE
LS	- LIGHT STANDARD
F.H.	- FIRE HYDRANT
C.B.	- CATCH BASIN
D.I.	- DITCH INLET
	- ACCESS / ENTRANCE
	- WATER LINE GIRB STOP
	- SOD / GRASS / LANDSCAPE
	- EXISTING GRAVEL
#1	- DENOTES REVISION NUMBER

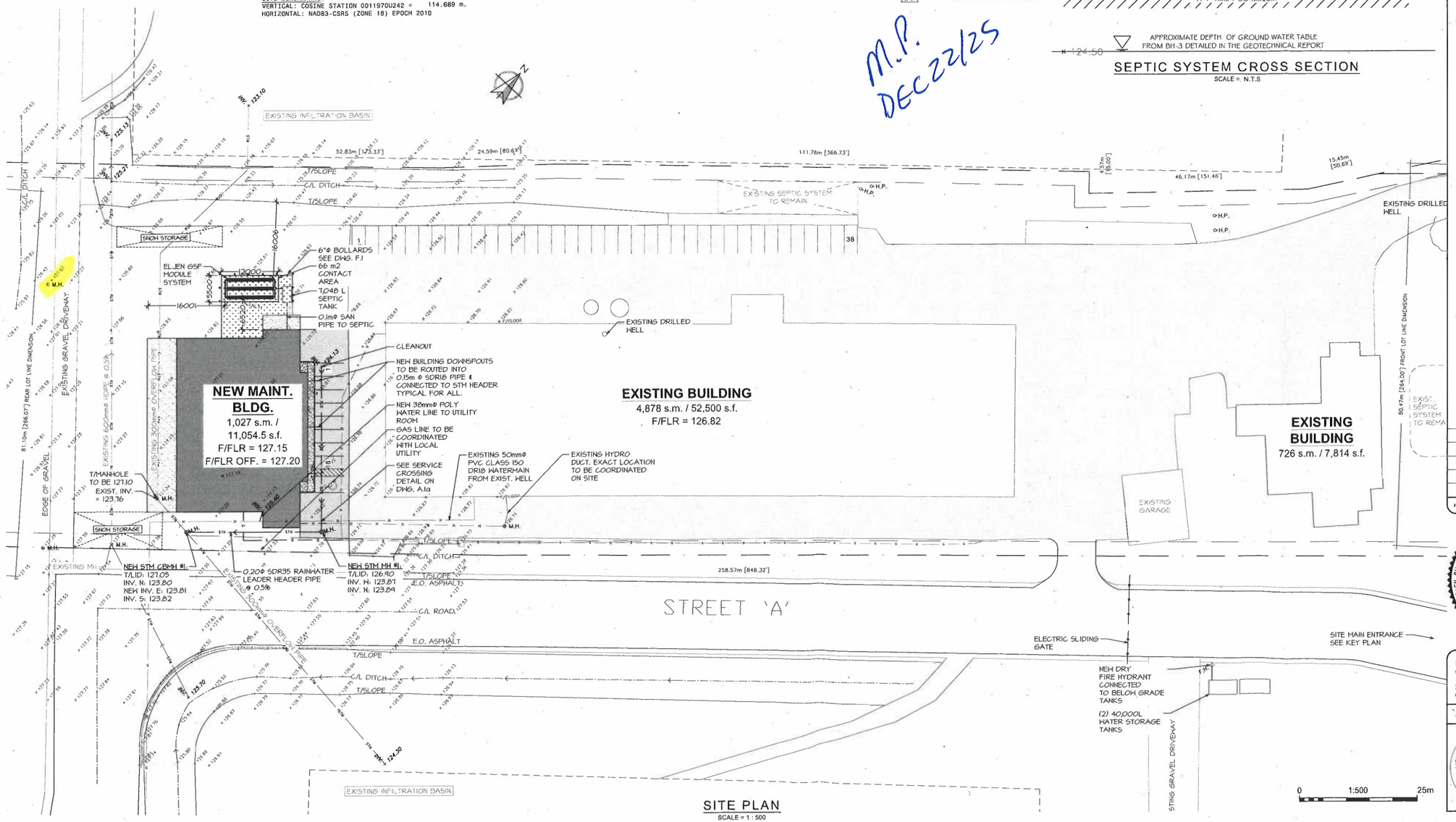
SEPTIC DESIGN		
DAILY DESIGN SANITARY FLOW RATE (DDSF)		
		TOTAL VOLUME
OFFICE AREA (15L/9.2 m2)	186.3 m2	1,502.4 L
LOADING DOORS (150 L EA.)	4 DOORS	600 L
	TOTAL:	2,102.4 L/day
TANK SIZING		
COMMERCIAL	Q (DDSF) x 3	6,307.2 L
	TANK SIZE:	7,048 L
ELJEN MODULE BED SIZING		
T (PERCOLATION RATE)	10 min/cm	NATIVE SOIL
Q (DDSF)	2,102.4 L/day	
ELJEN MODULES: GM5	22.2	
NUMBER OF MODULES PROP.	24	
FILTER BED AREA (QT/400)	52.56 m2	
FILTER BED AREA PROP.	66 m2	



APPROXIMATE DEPTH OF GROUND WATER TABLE FROM BH-3 DETAILED IN THE GEOTECHNICAL REPORT

SEPTIC SYSTEM CROSS SECTION
SCALE = N.T.S

M.P. DEC22/25



SITE PLAN
SCALE = 1 : 500

0 1:500 25m

SITE PLAN NOTES:

1. ALL DIMENSIONS & NOTES MUST BE VERIFIED ON JOB SITE BY CONTRACTOR. ANY DISCREPANCIES SHALL BE REPORTED TO THE OWNER.
2. ALL UNDERGROUND WORK AND ABOVE GROUND WORK TO BE DONE IN ACCORDANCE WITH CURRENT CITY PLANS, STANDARDS & SPECS.
3. THE OWNER COVENANTS & AGREES NOT TO MAKE A MATERIAL CHANGE OR CAUSE A MATERIAL CHANGE TO BE MADE TO A PLAN, SPECIFICATION, DOCUMENT OR OTHER INFORMATION ON THE BASIS OF WHICH THIS DRAWING WAS APPROVED BY THE CITY, WITHOUT NOTIFYING, FILING DETAILS WITH AND OBTAINING THE WRITTEN AUTHORIZATION OF THE CITY.
4. EXISTING ASPHALT:

   HEAVY DUTY ASPHALT:
   - 50mm HL3
   - 40mm HL6
   - 150mm (6") GRANULAR 'A', TYPE II
   - 300mm (12") GRANULAR 'B', TYPE I
5. ALL GRANULAR MATERIAL SHALL BE PLACED IN 300mm LIFTS AND COMPACTED TO 100% STANDARD PROCTOR.
6. INSTALL CONCRETE SIDEWALKS IN ACCORDANCE WITH OPSD-309.03 AND OPSD-310.04 FOR SIDEWALK RAMP.
7. SILT FENCE AS REQUIRED PER OPSD 219.110
8. GRASSED AREAS SHALL BE SOD AND 4" MINIMUM TOPSOIL. HYDROSEED FOR SLOPES EXCEEDING 4:1 SOD & SEAGE.
9. CONTRACTOR SHALL OBTAIN A R.O.W. WORK PERMIT FROM THE CITY OF QUINTE WEST PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL ROAD ALLOWANCE.
10. UTILITY CUTS WITHIN THE MUNICIPAL ROAD ALLOWANCE TO BE RESTORED USING HEAVY DUTY ASPHALT STANDARDS.
11. CONNECTION OF ALL SANITARY AND STORM SEWERS TO CONFORM TO OPSD-1006.010
12. NO LIGHTING WILL BE DIRECTED ONTO ADJACENT PROPERTIES BUT WILL ONLY BE DIRECTED ONTO THE SUBJECT LANDS
13. ALL CURBING IN ACCORDANCE WITH OPSD - 600.110
14. BARRIER FREE SIGNAGE FOR PARKING AREA TO BE IN ACCORDANCE WITH OBC 3.8.3.1 (1)

OPSD REFERENCES

1. RIGID PIPE BEDDING, COVER AND BACKFILL OPSD - 802.030
   EXCEPT a) USE "CLASS B-BEDDING" DETAIL ONLY FOR ALL PIPE BEDDING, DELETE "CLASS C" - BEDDING" DETAIL.
   b) THE "GRANULAR BEDDING MATERIAL" IS TO BE GRANULAR 'A' CRUSHED MATERIAL.
   c) "COVER MATERIAL" IS TO BE SAND FILL.
   d) DELETE "150 mm " FROM "NOTE 1" AND INSERT 225 mm FOR THE MINIMUM BEDDING DEPTH
   e) FOR A "WET TRENCH" CONDITION AS DETERMINED BY THE CITY ENGINEERS:
      i) THE "GRANULAR BEDDING MATERIAL" IS TO BE AN "HUB COARSE" GRADATION, CRUSHED LIMESTONE MATERIAL, AND
      ii) THE "COVER MATERIAL" IS TO BE LIMESTONE SCREENINGS OR GRANULAR 'A' CRUSHED MATERIAL.
2. PRECAST CONCRETE MAINTENANCE HOLE, 1200 mm DIAMETER, EXCEPT USE PRECAST MONOLITHIC BASE ONLY. OPSD - 701.010
3. MAINTENANCE HOLE STEPS, HOLLOW OPSD - 405.010
   EXCEPT DELETE "RECTANGULAR STAINLESS STEEL" STEP DETAILS. CAST IRON, SQUARE FRAME WITH CIRCULAR CLOSED OR OPEN
4. COVER FOR MAINTENANCE HOLES OPSD - 401.010
   EXCEPT DELETE "TYPE 'B' OPEN COVER".
5. CAST-IN-PLACE MAINTENANCE HOLE DROP STRUCTURE TEE, EXCEPT THE INVERT OF THE INLET END OF THE 90 DEGREE BEND IS TO BE PLACED AT THE "SPRINGLINE" OF THE MAIN SEWER PIPE. OPSD - 1003.010
6. SEWER SERVICE CONNECTIONS FOR RIGID MAIN PIPE SEWER, EXCEPT: OPSD - 1006.010
   a) THE BEDDING AND COVER MATERIALS ARE TO BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH OPSD-802.030
   b) FACTORY MADE TEES OR WYES ARE NOT REQUIRED FOR SANITARY SERVICE CONNECTIONS TO THE MAIN SEWER PIPE UNLESS SPECIFIED.
7. CONCRETE SIDEWALK OPSD - 310.010
8. CONCRETE BARRIER CURB WITH WIDE GUTTER OPSD - 600.010
9. CONCRETE BARRIER CURB OPSD - 600.110

No.	DATE	REVISION(S)	BY
4	DEC. 9/25	REVISED SEPTIC AREA	ERB
3	OCT. 14/25	ISSUED FOR TENDER	DGT
2	SEPT. 22/25	RE-ISSUED FOR SITE PLAN APPROVAL	ERB
1	AUG. 13/25	ISSUED FOR SITE PLAN APPROVAL	ERB

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NEW 11,054 s.f. BUILDING for
WASTE MANAGEMENT OF CANADA CORP
2413 CARP RD.
OTTAWA, ON

SERVICING PLAN AND SEPTIC DETAILS

LICENSED PROFESSIONAL ENGINEER
Dec.19/2025
E. R. BUNTT
100515244
PROVINCE OF ONTARIO

DATE: JUNE 2025	CONTRACT No. 2511
CHECKED BY:	DRAWING No.: A.1a
DESIGNED BY:	
DRAWN BY: ERB	
SCALE: AS NOTED	

LEGAL DESCRIPTION:

INFO TAKEN FROM:

REGISTERED PLAN 5R-11322
PLAN OF SURVEY OF
PART OF THE SOUTH HALF
OF LOT 5
CONCESSION 3
GEOGRAPHIC TOWNSHIP OF
HUNTLEY
TOWNSHIP OF WEST CARLETON
FAIRHALL, MOFFATT & WOODLAND LTD.

RVCA RECEIVED
DEC 22 2025
REFER TO:

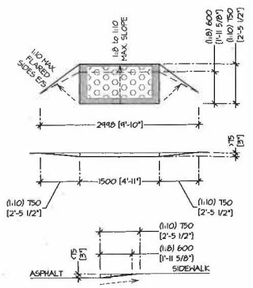
SITE LEGEND:

+ 00.00	- EXIST. GRADE ELEVATION
00.00	- PROPOSED GRADE ELEVATION
(00.00)	- PROPOSED DITCH ELEVATION
	- FLOW / DIRECTION
H	- HYDRO
STM	- STORM PIPE
SAN	- SANITARY PIPE
W	- WATER LINE
G	- GAS LINE
B	- BELL LINE
	- FENCE
M.H.	- MAN HOLE
H.P.	- HYDRO POLE
LS	- LIGHT STANDARD
F.H.	- FIRE HYDRANT
C.B.	- CATCH BASIN
D.I.	- DITCH INLET
	- ACCESS / ENTRANCE
	- WATER LINE CURB STOP
	- SOD / GRASS / LANDSCAPE
	- EXISTING GRAVEL
#1	- DENOTES REVISION NUMBER

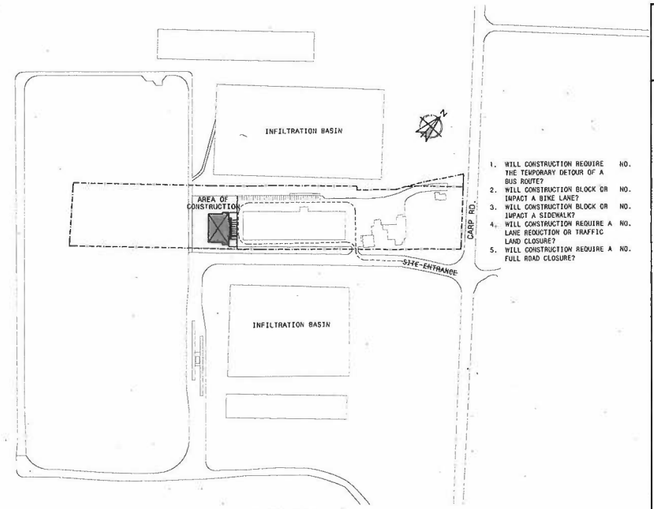
SITE STATISTICS:

ZONED :	RH Zone
MIN. PROPERTY AREA :	8,000 s.m.
PROPERTY AREA :	41,188 s.m.
NEW FACILITY AREA :	1,027 s.m.
EXISTING FACILITY AREA :	5,604 s.m.
TOTAL FACILITY AREA:	6,631 s.m.
LOT COVERAGE:	16.0 %
MAX LOT COVERAGE:	50 %
NEW BUILDING HEIGHT :	10.6 m.
MAX BUILDING HEIGHT :	15 m.
No. OF STOREYS :	-1-
MIN. FRONT YARD SETBACK :	15 m.
BLDG. FRONT SETBACK:	301.5 m.
MIN. INTERIOR SIDEYARD SETBACK :	3 m.
BLDG. MIN. INTERIOR SIDEYARD SETBACK:	4.9 m.
MIN. REAR YARD SETBACK :	15 m.
BLDG. REAR SETBACK:	175.5 m.
No. OF PROPOSED PARKING SPACES Shown :	9 SP.
No. OF BARRIER-FREE SPACES - INCL. :	1 SP.
No. OF REQUIRED PARKING SPACES	
0.75/100m2 HEAVY EQUIP.SERVICE:	8 SP.
0.8/100m2 LIGHT INDUSTRIAL EXISTING:	39 SP.
TYPICAL PARKING WIDTH	2.8 m.
TYPICAL PARKING LENGTH	6.0 m.

SITE BENCHMARKS:
VERTICAL: COSINE STATION 0011970U242 = 114.689 m.
HORIZONTAL: NAD83-CSRS (ZONE 18) EPOCH 2010

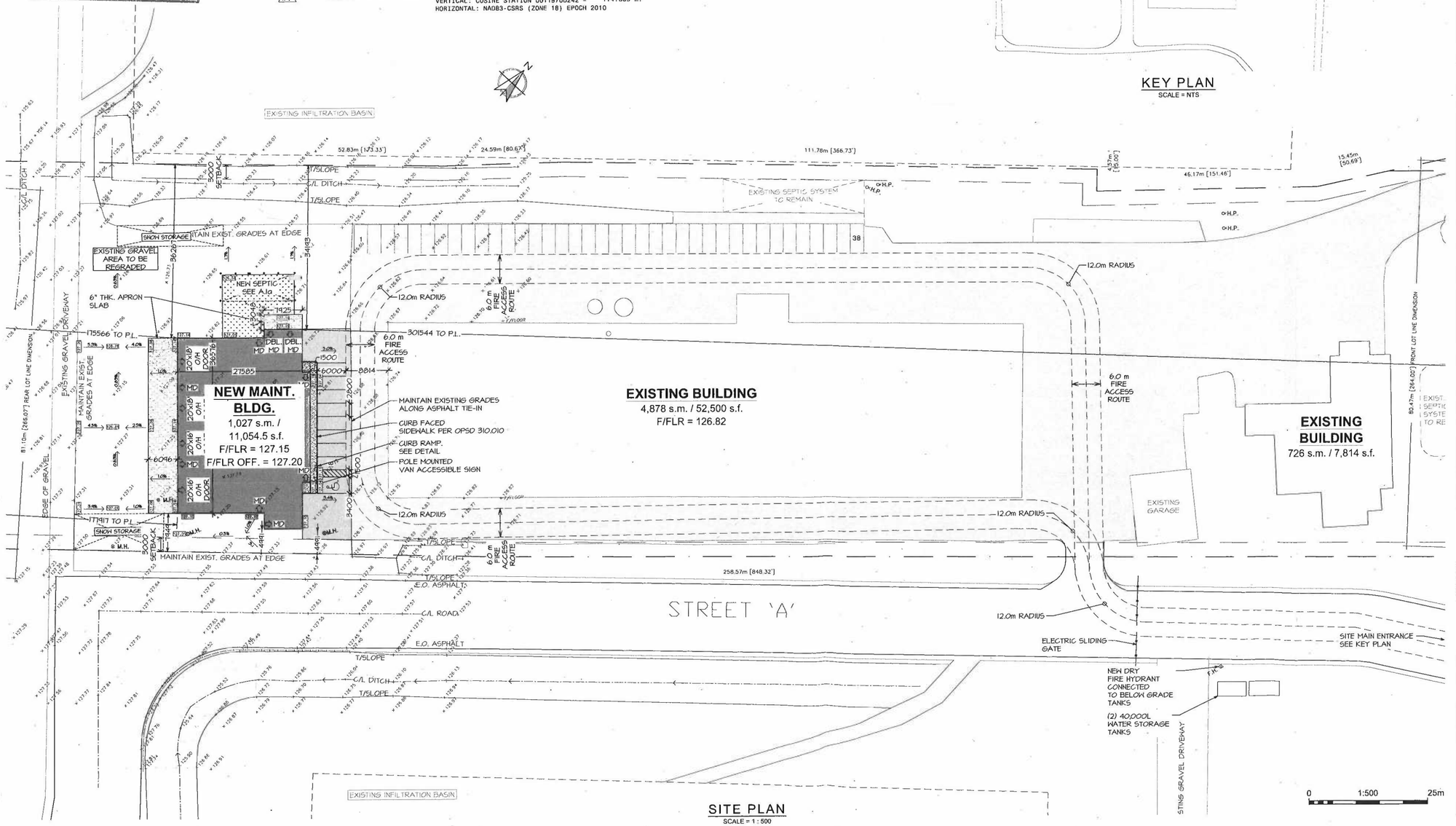


CURB RAMP @ EXTERIOR WALKS
3.8.3.2(3) Vertical Rise less than 75mm



1. WILL CONSTRUCTION REQUIRE THE TEMPORARY DETOUR OF A BUS ROUTE? NO.
2. WILL CONSTRUCTION BLOCK OR IMPACT A BIKE LANE? NO.
3. WILL CONSTRUCTION BLOCK OR IMPACT A SIDEWALK? NO.
4. WILL CONSTRUCTION REQUIRE A LANE REDUCTION OR TRAFFIC LAND CLOSURE? NO.
5. WILL CONSTRUCTION REQUIRE A FULL ROAD CLOSURE? NO.

KEY PLAN
SCALE = NTS



SITE PLAN
SCALE = 1 : 500

0 1:500 25m

SITE PLAN NOTES:

1. ALL DIMENSIONS & NOTES MUST BE VERIFIED ON JOB SITE BY CONTRACTOR. ANY DISCREPANCIES SHALL BE REPORTED TO THE OWNER.
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4. EXISTING ASPHALT:

   HEAVY DUTY ASPHALT:
   - 50mm HL3
   - 40mm HL8
   - 150mm (6") GRANULAR 'A', TYPE II
   - 300mm (12") GRANULAR 'B', TYPE I
5. ALL GRANULAR MATERIAL SHALL BE PLACED IN 300mm LIFTS AND COMPACTED TO 100% STANDARD PROCTOR.
6. INSTALL CONCRETE SIDEWALKS IN ACCORDANCE WITH OPSD-310.03 AND OPSD-310.04 FOR SIDEWALK RAMP.
7. SILT FENCE AS REQUIRED PER OPSD 219.110
8. GRASSED AREAS SHALL BE SOD AND 4" MINIMUM TOPSOIL. HYDROSEED FOR SLOPES EXCEEDING 4:1 SOD & STAKE.
9. CONTRACTOR SHALL OBTAIN A R.O.W. WORK PERMIT FROM THE CITY OF GLOUCESTER PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL ROAD ALLOWANCE.
10. UTILITY CUTS WITHIN THE MUNICIPAL ROAD ALLOWANCE TO BE RESTORED USING HEAVY DUTY ASPHALT STANDARDS.
11. CONNECTION OF ALL SANITARY AND STORM SEWERS TO CONFORM TO OPSD-1006.010
12. NO LIGHTING WILL BE DIRECTED ONTO ADJACENT PROPERTIES BUT WILL ONLY BE DIRECTED ONTO THE SUBJECT LANDS
13. ALL CURBING IN ACCORDANCE WITH OPSD - 600.110
14. BARRIER FREE SIGNAGE FOR PARKING AREA TO BE IN ACCORDANCE WITH OBC 3.8.3.1 (1)

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   d) DELETE "150 mm " FROM "NOTE 1" AND INSERT 225 mm FOR THE MINIMUM BEDDING DEPTH
   e) FOR A "WET TRENCH" CONDITION AS DETERMINED BY THE CITY ENGINEER:
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      ii) THE "COVER MATERIAL" IS TO BE LIMESTONE SCREENINGS OR GRANULAR 'A' CRUSHED MATERIAL.
2. PRECAST CONCRETE MAINTENANCE HOLE, OPSD - 701.010
   1200 mm DIAMETER, EXCEPT USE PRECAST MONOLITHIC BASE ONLY.
3. MAINTENANCE HOLE STEPS, HOLLOW OPSD - 405.010
   EXCEPT DELETE "RECTANGULAR STAINLESS STEEL" STEP DETAILS. CAST IRON, SQUARE FRAME WITH CIRCULAR CLOSED OR OPEN.
4. COVER FOR MAINTENANCE HOLES OPSD - 401.010
   EXCEPT DELETE "TYPE 'B' OPEN COVER".
5. CAST-IN-PLACE MAINTENANCE HOLE DROP OPSD - 1003.010
   STRUCTURE TEE. EXCEPT THE INVERT OF THE INLET END OF THE 90 DEGREE BEND IS TO BE PLACED AT THE "SPRINGLINE" OF THE MAIN SEWER PIPE.
6. SEWER SERVICE CONNECTIONS FOR RIGID MAIN PIPE SEWER. EXCEPT: OPSD - 1006.010
   a) THE BEDDING AND COVER MATERIALS ARE TO BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH OPSD-802.030
   b) FACTORY MADE TEES OR WYES ARE NOT REQUIRED FOR SANITARY SERVICE CONNECTIONS TO THE MAIN SEWER PIPE UNLESS SPECIFIED.
7. CONCRETE SIDEWALK OPSD - 310.010
8. CONCRETE BARRIER CURB WITH WIDE GUTTER OPSD - 600.010
9. CONCRETE BARRIER CURB OPSD - 600.110

No.	DATE	REVISION(S)	BY
4	DEC. 19/25	REVISED SEPTIC AREA	ERB
3	OCT. 14/25	ISSUED FOR TENDER	DGT
2	SEPT. 22/25	RE-ISSUED FOR SITE PLAN APPROVAL	ERB
1	AUG. 13/25	ISSUED FOR SITE PLAN APPROVAL	ERB

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NEW 11,054 s.f. BUILDING for
WASTE MANAGEMENT OF CANADA CORP
2413 CARP RD.
OTTAWA, ON

SITE PLAN AND DETAILS

LICENSED PROFESSIONAL ENGINEER — Dec.19/2025 — E. R. BURTT — 100515244 — PROVINCE OF ONTARIO

DATE:	JUNE 2025
CONTRACT No.	0000
CHECKED BY:	
DESIGNED BY:	
DRAWN BY:	ERB
SCALE:	AS NOTED
DRAWING No.:	A.1

Rideau Valley Conservation Authority

Permit
Part 8 – Sewage System
Ontario Building Code

Do Not Complete
Permit No 25-418
Revision No
Date
Related Application

A copy of this permit must be posted on the property at all time during construction. OBC, Division C — Part 1, Section 1.3.2.1

This permit verifies that the on-site sewage system was reviewed and approved for construction under the Ontario Building Code Act (Building Code Act, 1992, S.O. 1992, c. 23) and Ontario Building Code (O. Reg. 163/24) as amended.

Inspected & Recommended by: Matt Panciuk
Owner: Waste Management Of Canada Corp.
Inspection Date & Time: Civic: DEC 23, 2025
Weather:
Address: 2413 Carp Road
Legal: 5R-11332
Within the municipality of GOULBOURN

Design Flow for Commercial / Institutional / Industrial (as per Table 8.2.1.3.B)

Q: 1502.41 + 600 = 2102.41 L/day

septic tank 6307.23(min) L
effluent filter YES
pump rate L/15 MIN
treatment unit Eljen GSF A42
number of units 24

weigh bills for Eljen Sand	■ yes	❒ no
grain size analysis required	■ yes	❒ no
site to be scarified	❒ yes	■ no
clay seal inspection	❒ yes	■ no
mantle required	❒ yes	■ no
sub-grade inspection	■ yes	❒ no

ELEVATION ☒ In Ground ☐ Partially Raised ☐ Fully Raised

TYPE OF SYSTEM

❒ **Trench**
○ **Pipe and Stone or** ○ **Chambers**
type of chamber
loading area m^2
total trench length m
trench configuration

■ **Dispersal Bed**
◉ BMEC ○ Type A ○ Type B
stone m^2
sand 66 m^2
pipe 3 rows of 8 Eljen @ 1.54m O/c
weight of sand kg

❒ **Shallow Buried Trench**
pipe length m
orifice spacing m

❒ **Filter Media Bed**
stone m^2
extended base m^2
pipe
weight of filter media kg
loading area m^2

❒ **Class 5 Holding Tank**

❒ **Septic Tank Only**

Manager, Septic System Approvals: E. Kothawala Permit Date: December 22, 2025

Comments: 1. Engineer to verify subgrade prior to sand fill placement.
2. Sump pumps and floor drains are not to be connected to the sewage system.

■ maintenance/pumping required ❒ ESA permit # required ■ engineer to verify ■ subgrade ❒ squirt height

❒ Class 5 Holding Tank approval only valid for three years from date of issue

Manager, Septic System Approvals: Revision Date:

Comments:

NOTE: For further details, refer to corresponding application.

June 2025

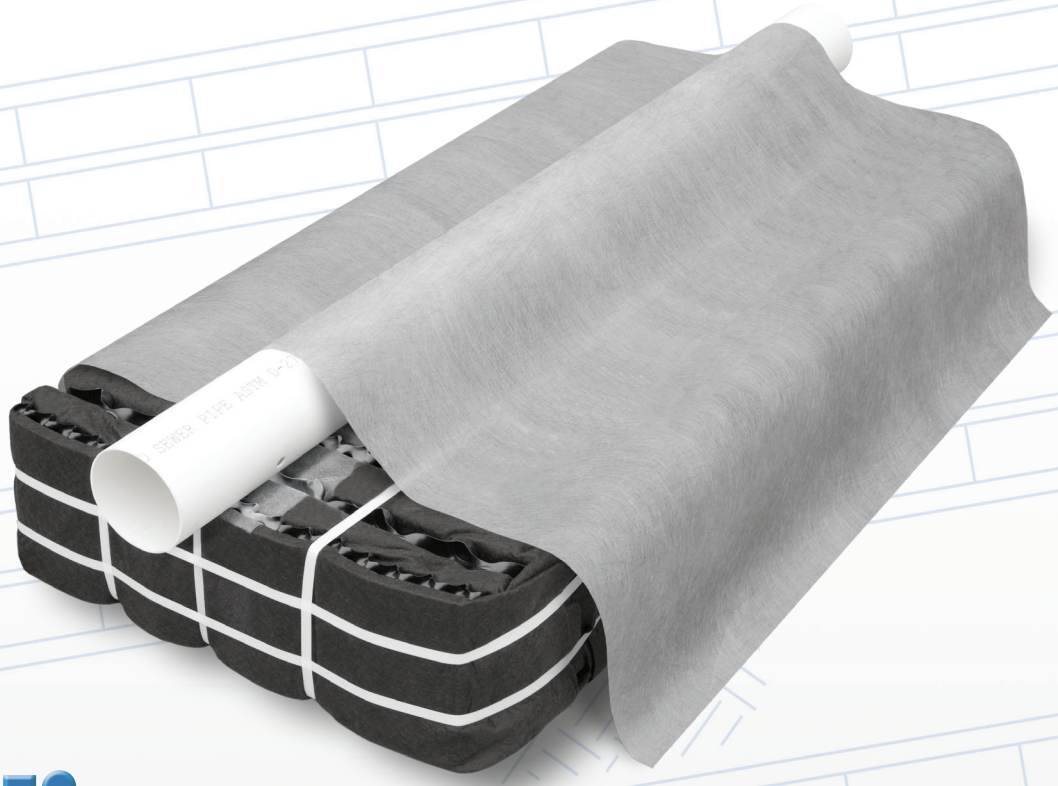
Appendix 4

Proposed Septic Spec Sheet

GSF®

Geotextile Sand Filter

Eljen GSF System Overview



eljen CORPORATION

Innovative Onsite Products & Solutions Since 1970

www.eljen.com

Eljen GSF System Description

Each GSF Module is made up of geotextile fabric and a plastic core material that work together to provide vertical surface area and oxygen transfer. The GSF System applies secondary treated effluent to the soil, increasing the soil's long-term acceptance rate. A Specified Sand layer provides additional filtration, and prevents saturated conditions.

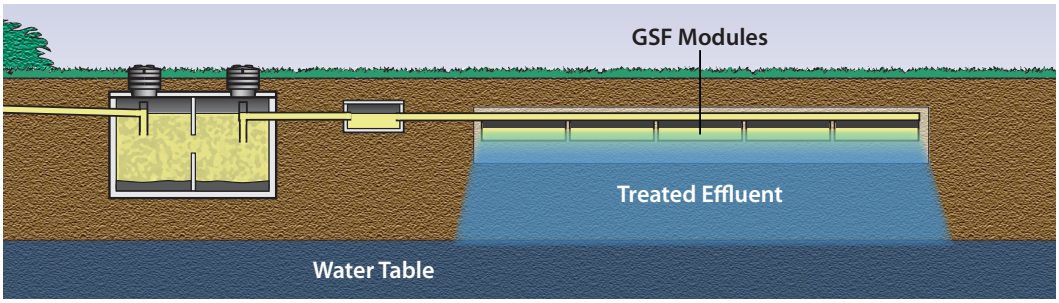
PRIMARY TREATMENT ZONE

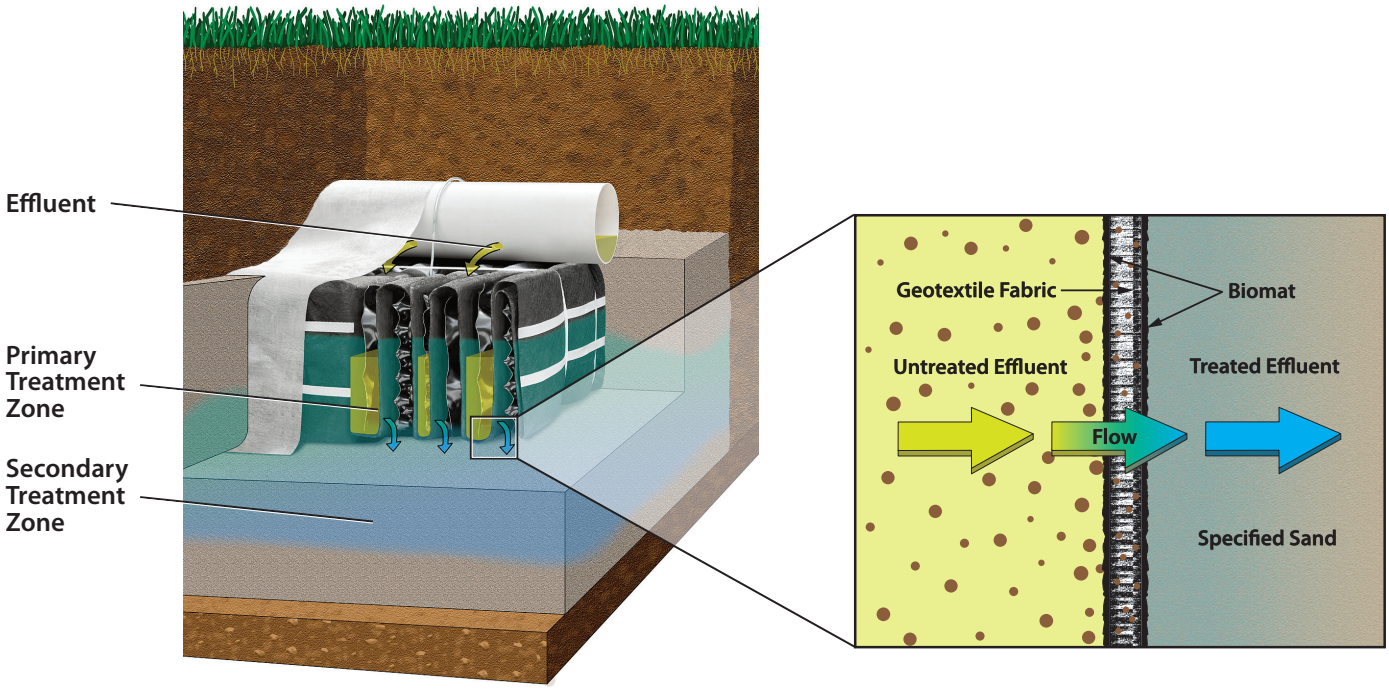
- Perforated pipe is centered above the GSF Module to distribute septic effluent over and into corrugations created by the plastic core of the GSF Module.
- The Module's unique design provides increased surface area for biological treatment of nutrients and contaminants.
- Open air channels within the Module support aerobic bacterial growth on the Module's geotextile fabric interface, and promote oxygen in the system.
- An anti-siltation geotextile fabric covers the top and sides of the GSF Module to protect the system from the migration of fines.
- The GSF Module provides biomat management, and takes the burden of treatment and biomat development off of the native soil.

SECONDARY TREATMENT ZONE

- Effluent drips into the Specified Sand layer and supports unsaturated flow into the native soil.
- The Specified Sand layer also protects the soil from compaction and helps maintain cracks and crevices in the soil.
- Native soil provides final filtration and allows for groundwater recharge.

GSF SYSTEM OPERATION





Testing Overview and Performance

NSF Standard 40

Certified to NSF/ANSI Standard 40

This standard determines whether treatment systems product secondary treatment effluent quality, with Class I systems achieving a 30-day average effluent quality of 25 mg/L CBOD5 and 30 mg/L TSS or less, and pH 6.0-9.0. Testing and certification are done at an independent third party testing facility.

SETUP: Gravity GSF system with 6" of ASTM C33 sand in a bed configuration. 450 gal/day, (2.0 gal/ ft^2 loading rate).

RESULTS: The Eljen GSF is Tested and Certified by NSF to NSF Standard 40 Class 1 since 2014.

More information can be found at www.NSF.org.

NSF Standard 245

Certified to NSF/ANSI Standard 245

This standard includes Total Nitrogen reduction requirements with Class I systems achieving a 30-day average effluent quality of more than 50% Total Nitrogen removal, 25 mg/L CBOD5 and 30 mg/L TSS or less, and PH 6.0-9.0. Testing and certification are done at an independent third party testing facility.

SETUP: Gravity GSF system in a bed configuration with 18" of ASTM C33 sand, 12" of sand/woodchip mixture, and 2" of limestone. 450 gal/day (2.0 gal/ft^2 loading rate).

RESULTS: Tested and Certified by NSF to NSF Standard 245 Class 1 since 2018.

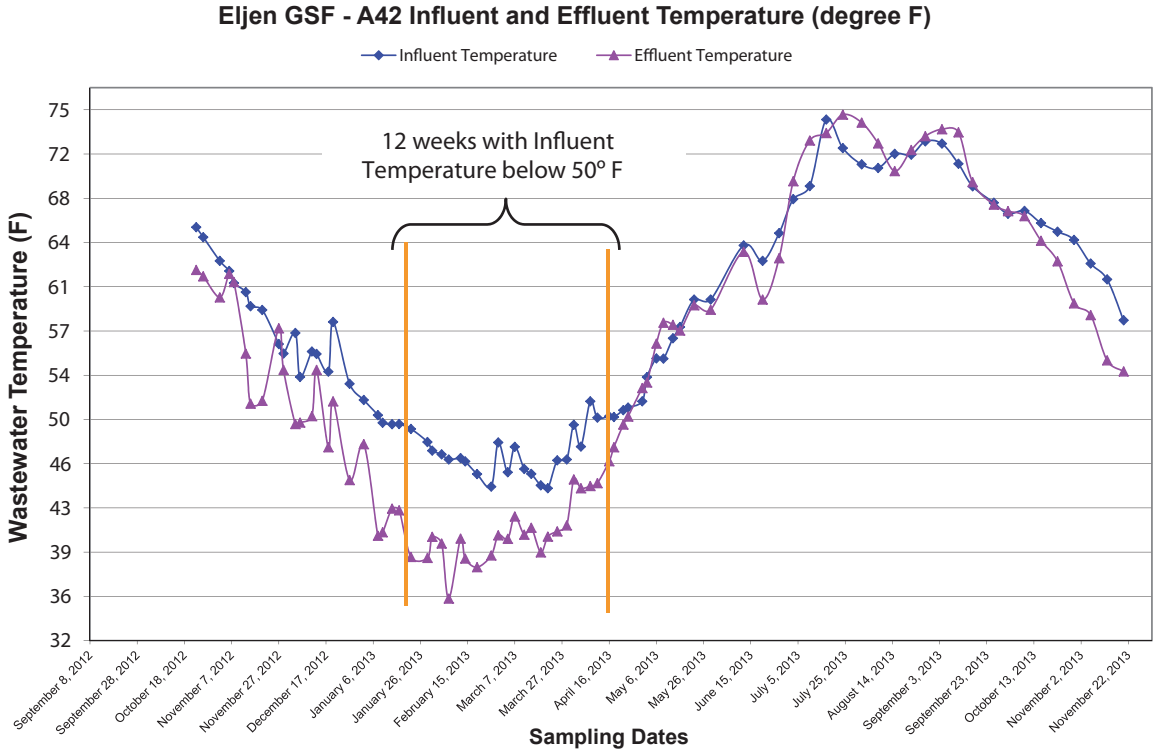
More information can be found at www.NSF.org.

The third-party testing results listed below were taken over a 12 month consecutive period. This extended sampling period provided verification to the stability and consistency of the Eljen GSF's performance and capability to handle colder weather conditions. A summary of the test results from the independent third-party evaluation are listed below:

Eljen GSF A42 Modules Treatment Performance during third party 12 months testing (includes 12 consecutive weeks with influent temperature below 50° F)

	CBOD (mg/L)	TSS (mg/L)	Fecal Coliform (MPN/100ml)
Average	2.0	2.7	66*
Average (cold water period)	1.2	1.7	13*
Median	1.0	2.5	71*
Min Value	1.0	2.5	2*
Max Value	7.2	7.0	10 965*

*Geometric average



COMPANY HISTORY

Established in 1970, Eljen Corporation created the world's first prefabricated drainage system for foundation drainage and erosion control applications. In the mid-1980s, we introduced our Geotextile Sand Filter products for the passive advanced treatment of onsite wastewater in both residential and commercial applications. Today, Eljen is a global leader in providing innovative products and solutions for protecting our environment and public health.

COMPANY PHILOSOPHY

Eljen Corporation is committed to advancing the onsite industry through continuous development of innovative new products, delivering high-quality products and services to our customers at the best price, and building lasting partnerships with our employees, suppliers, and customers.

eljen CORPORATION

Innovative Onsite Products & Solutions Since 1970

Tel: 800-444-1359 • Fax: 860-610-0427

www.eljen.com

Appendix 5

Email Correspondence with OFS Fire Prevention Officer

Evan Burtt

From: Evans, Allan <Allan.Evans@ottawa.ca>
Sent: January 13, 2026 9:58 AM
To: Evan Burtt
Cc: Hilary Murphy
Subject: RE: WM Carp Site Plan
Attachments: Rural Water Technical Drawings.pdf; W51 to 54 Combined.pdf

Hi Evan - thanks for the meeting today. As discussed:

OFS accepts location of tanks / hydrant
No need for remote hydrant system
Access through gate to be provided by OFS lockbox installation (clarification around gate functionality to be provided (does it stay open, etc))

General requirements we discussed:
Fire Hydrant to be 1.5m from edge of pavement.
If water table too high, sealed weep holes on fire hydrant required.
Can build layby if needed/desired – not required.

Ottawa Fire Department Lockbox:

City Locksmith – 1495 Startop Rd – (613) 746-5397 - $175+tax including sticker and hardware
A Everest Locksmith – 1581 Bank St – (613) 248–3535 - $175+tax including sticker and hardware

Allan Evans

Fire Protection Engineer / Ingénieur de Protection d'Incendies
Prevention Division / Prévention des Incendies
Ottawa Fire Services / Service des Incendies d'Ottawa
1445 Carling Avenue / 1445 Avenue Carling
Ottawa, ON K1Z 7L9
Allan.Evans@Ottawa.ca
☎ (613) 913-2747 | ☎ (613) 580-2424 x24119 | 🖷 (613) 580-2866 | 🖃 Mail Code: 25-102 |
Book time with Evans, Allan

Appendix 6

Property Consolidation Scope Being Undertaken

January 21, 2026

Remi Godin
Waste Management of Canada Corporation
2393 Carp Road
Ottawa, ON K0A 1L0

Re: Professional Services Proposal for Parcel Consolidation – 2393 Carp Road, Ottawa, Ontario

Dear Remi:

WSP Canada Inc., with support from Dentons Canada LPP, is pleased to submit this Proposal to provide the Waste Management of Canada Corporation (the "Client"), with the provision of professional services to undertake the consolidation of 17 parcels for the lands at 2393 Carp Road in Ottawa (the "Site").

1. Context and Objectives

It is WSP's understanding that the Client is seeking to consolidate 17 land parcels located on Carp Road having the following municipal addresses of: 2485, 2437, 2425, 2413, 512, 2375, 2301, 2397, 2393, 2389, 2383, 2379, 2425, 2363, 2357, 2353, and 2349 in the City of Ottawa. The 17 parcels would be consolidated to one, singular municipal address of 2393 Carp Road.

It is also our understanding that the Client is requesting WSP Canada Inc. ("WSP") to provide planning services to assist with coordination with Dentons Canada LPP, who will undertake the lot consolidation.

Section 3 of this Proposal outlines our proposed scope and associated budget to undertake the work, with support from Dentons Canada LPP.

2. Our Firm

WSP has been providing an array of consulting engineering services to public and private sector clients across Canada since 1959. During the past 60+ years, acquisitions and organic growth have significantly augmented WSP's professional services, resulting in our position as one of Canada's largest consulting planning and engineering firms.

WSP's Planning team includes more than 60 planners, urban designers, and landscape architects in Ontario and Atlantic Canada and many more throughout Canada and in our international offices, which we can use as resources should the need arise. While we are a large practice, our offices function as creative studios with dynamic teams assembled to provide the best expertise for each development opportunity. At WSP, our team collaborates across disciplines to address the complex challenges of a rapidly changing world. Informed by global expertise, rooted in local practice, we pursue

transformative and contextual solutions that are customized to each development opportunity.

Our planning philosophy is based on professionalism, excellent client service and quality, collaboration, and a team to build the constructive and collaborative project environment that is integral to innovative problem solving and timely issues resolution with proven and successful results.

3. Services

The Services to be provided by WSP and Denton's Canada LPP shall consist of the following:

Part A – Coordination with Dentons Canada LPP (WSP)

- Coordination and liaison with Dentons Canada LPP related to the lot parcel consolidation at 2393 Carp Road.
- Project management, coordination, and administration.

Part B – Parcel Consolidation (Dentons Canada LPP)

- Review title of a sample parcel.
- Evaluate alternatives and recommend best method for consolidating parcels.
- Please note that Part B – Parcel Consolidation, to be completed by Dentons Canada LPP, will be carried out in two phases. The services described in this Proposal and outlined in **Appendix A**, pertain only to the first phase.

Assumptions

- Only the tasks explicitly noted in **Section 3** of this proposal will be undertaken.
- Project meetings are not included under this proposed scope of work.
- Our fees do not include tasks associated with any additional Planning Approvals (i.e., Official Plan Amendment, Zoning By-law Amendment, Draft Plan of Subdivision Consent to Sever, etc.) not explicitly scoped in this proposal.
- If additional services are indicated throughout the process and/or upon completion of the initial meetings, WSP and/or Dentons Canada LPP would be pleased to provide you with a proposal for the services should you wish.

4. Fees

WSP will undertake the above work outlined in Section 3, Part A, in accordance with the Client's 2026 MSA rates at a fixed-fee cost, as stipulated below. **For budgeting purposes, WSP fees are $5,000.00, excluding taxes and disbursements**.

Dentons Canada LPP will undertake the work outlined in Section 3, Part B, on a time-spent basis. For budgeting purposes, Dentons' fees are estimated at $6,000. As noted in Section 3, Part B – Parcel Consolidation, to be completed by Dentons

Canada LPP, will be carried out in two phases. The services described in this Proposal and outlined in Appendix A, pertain only to the first phase.

Below is a breakdown of the fees:

Task	Fee Estimate
Part A – Coordination with Dentons Canada LPP (WSP)	
Coordination and liaison with Dentons Canada LPP.	$3,700
Project management, coordination, and administration.	$1,300
Part B – Parcel Consolidation (Dentons Canada LPP)	
Review title of a sample parcel.	$1,000
Evaluate alternatives and recommend best method for consolidating parcels.	$5,000
TOTAL	**$11,000**

The WSP planning services outlined above would be led by Nadia De Santi, MCIP, RPP, Strategic Advisor and Jill MacDonald, MCIP, RPP, Senior Planner. WSP rates will as per the 2026 Master Service Agreement (MSA) with the Client. Project Team CVs are included in **Appendix B**.

Notes on Fees

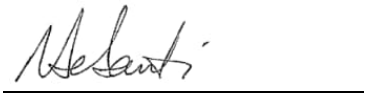
- Services undertaken by WSP identified above will be conducted on a **Fixed-Fee basis**. Any additional scope will require additional fees, subject to client approval. All fees are exclusive of disbursements and HST. are a fixed-fee cost excluding disbursements and HST.
- As per Dentons Canada LPP proposal found in **Appendix A**, **estimated fee are legal fees for the first phase only and do not include taxes and disbursements. The estimated cost of the second phase will be informed by the outcome of the first phase of work.**

5. Conclusion

It is our pleasure to submit this proposal to assist in undertaking the aforementioned professional services. Should you have any questions, please contact Cristina.Olarte@wsp.com or Nadia.De-Santi@wsp.com.

Yours truly,

WSP Canada Inc.



Nadia De Santi, MCIP, RPP
Practice Lead

Cristina Olarte, P. Eng.
Senior Waste Management Engineer

Attachments: Appendix A – Denton's Canada LPP Proposal
Appendix B - CVs

Roberto D. Aburto
Partner
roberto.aburto@dentons.com
D + 1 613 288 2716

Dentons Canada LLP
99 Bank Street, Suite 1420
Ottawa, ON, Canada K1P 1H4

dentons.com

January 13, 2026

PRIVILEGED & CONFIDENTIAL
SENT VIA E-MAIL (CRISTINA.OLARTE@WSP.COM)

Cristina Olarte
Senior Waste Management Engineer
Waste Management Corporation/ WSP Canada Inc.
55 King Street, 7th Floor
St. Catharines, Ontario
L2R 3H5 Canada

Dear Ms. Olarte:

Re: 2393 Carp - Parcel Consolidation

WSP Planning team reached out to Dentons to request assistance with the consolidation of 17 parcels f or the lands at 2393 Carp Road on behalf of Waste Management of Canada Corporation. This would be a two phase process, and the legal fees for the first phase are as follows:

1) Review title of a sample parcel - $500 - $1,000

2) Evaluate alternatives and recommend best method for consolidating parcels - $3,000 - $5,000

These amounts are legal fees only and do not include taxes and disbursements. The potential cost of the second phase will be informed by the outcome of the first phase of work.

Should you have any additional questions or require any additional information, please let us know.

Yours truly,

Roberto Aburto
Partner

NADIA DE SANTI, MCIP, RPP

Practice Lead, Urban and Community Planning

Areas of practice

Project Management

Land Use Planning & Policy

Land Development Approvals

OLT Hearings

Mediation

Facilitation

Community & Indigenous Engagement

LPAT Mediation

Environmental Assessment

PROFILE

Nadia De Santi has 25 years of professional planning experience including municipal policy and land development approvals. She is adept at building client relationships, managing multi-disciplinary project teams, and working with approval agencies. She is passionate about community engagement and facilitation and makes it a priority to understand and address local community issues and values. Nadia has obtained a Certificate of Completion "Working Effectively with Aboriginal Peoples™ for Governments". Nadia has also completed the International Association of Public Participation (IAP2) Foundations in Public Participation (Planning + Techniques Modules).

Her diverse experience ranges from federal government campus master planning, provincial government highest and best use analyses, and a wide range of planning projects for municipal governments. Her experience in municipal policy projects includes preparing Official Plans and Zoning By-laws, developing Community Improvement Plans, Age-Friendly Community Action Plans and Land Use Plans and Zoning By-laws for Indigenous communities, and providing planning services to municipalities.

Nadia is also involved in a broad range of development approvals projects including Official Plan and Zoning By-law Amendments, Site Plan Control Approvals, Plans of Subdivision, and Committee of Adjustment applications. Nadia has been qualified by the Ontario Land Tribunal (OLT) as an expert witness in land use planning.

EDUCATION

Master of Urban and Regional Planning, Queen's University, Kingston, ON	1999
Bachelor of Arts, Honours (Geography), Laurentian University, Sudbury, ON	1997

PROFESSIONAL DEVELOPMENT

Writing for Promotional Communications, University of Ottawa, ON	2015
Natural Heritage Information Centre Data Sensitivity Training	2015
Certificate of Completion – Working Effectively with Aboriginal Peoples™ for Governments, Indigenous Corporate Training Inc.	2009
Faculty of Law Certificate in Enhanced Negotiation, University of Windsor, ON	2009
Certificate in Screening under the Canadian Environmental Assessment Act	2004

PROFESSIONAL ASSOCIATIONS

Canadian Institute of Planners, 2003	CIP
Ontario Professional Planners Institute, 2002	OPPI
Registered Professional Planner, 2002	RPP

NADIA DE SANTI, MCIP, RPP

Practice Lead, Urban and Community Planning

CAREER

Practice Lead, Planning, Landscape Architecture and Urban Design, WSP, Ottawa, ON	2021-present
Senior Project Manager, Planning, Landscape Architecture and Urban Design, WSP, Ottawa, ON	2016 – 2021
Senior Planner / Project Manager, Planning and Environmental Design, MMM Group Limited, Ottawa, ON (WSP Acquisition)	2015 – 2016
Senior Planner and Manager of Business Development, FOTENN Consultants Inc., Ottawa, ON	2009 – 2015
Senior Planner, FOTENN Consultants Inc., Ottawa, ON	2007 - 2009
Planner, FOTENN Consultants Inc., Ottawa, ON	2003 - 2007
Environmental Planner, Delcan Corporation, Ottawa, ON	2000 – 2003
Analyst, Real Property Management Division, Public Works and Government Services Canada, Ottawa, ON	2000
Land Use Planner, Ministry of Housing and Settlements, Port of Spain, Trinidad and Tobago	1999 - 2000
Analyst, Real Property Management Division, Treasury Board Secretariat, Ottawa, ON	1999

PROFESSIONAL EXPERIENCE

Special Projects

- **Infrastructure Ontario, Development Feasibility Study, Central Ontario – (2023-present): Partner in Charge:** Nadia led a multi-disciplinary team on the due-diligence stage of the proposed development, including the final Concept Plan design. This high-profile project was multi-faceted, requiring coordination of numerous deliverables under tight deadlines. Nadia was client-facing and managed the client relations and project budget.

- **Provincial Government Uses, Preliminary Site Assessments for Multiple Sites, Eastern and Central Ontario (2024 - Present): Partner in Charge** – Responsible for preparing Due Diligence Reports, Technical Analysis, Site Fit Concepts for Site Selection; and leading the Indigenous engagement with numerous First Nations on the land use planning, natural heritage and arborist work. Client: Infrastructure Ontario.

- **Loyalist Township, Amherstview West Secondary Plan and Municipal Class Environmental Assessment (MCEA), Amherstview, ON (2021 – 2025):** Project Manager. Leading a multi-disciplinary team in completing an integrated Planning and Municipal Class EA process for a new community. Client liaison, lead engagement specialist, and providing strategic advice on numerous reports including the Public Engagement Program Strategy, Background Analysis Report, Growth Management Report, Secondary Plan, Official Plan Amendment, Zoning By-law Amendment, and a Future Development Area Memo.

- **Lanark County, Lanark County Municipal Opportunities and Tools for Affordable Housing, Lanark County, ON (2021 – 2022): Senior Planner.**

Conducted a background review, prepared policy and zoning recommendations for the County's lower-tier municipalities, coordinated public and stakeholder consultation events, and assisted with the preparation of the Housing Study Report, including writing of draft County Official Plan policies.

- **Municipality of North Grenville, North Grenville Housing Strategy, North Grenville, ON (2021 – 2022): Senior Planner.** Conducted a background review of current legislation, policy, zoning, and the role of housing partners in the Municipality and supported the authoring of the Housing Strategy Report.

Municipal Planning – Official Plan and Zoning By-Law Reviews

- **Town of Petawawa, Official Plan Review, ON (2022-2024): Strategic Advisor.** This project included key policy changes in the areas of housing, economic development, sustainability, and climate change. Nadia was the lead presenter at the Statutory Public Open House, Statutory Public Meeting in person, and attended the Council meeting virtually.
- **Prince Edward County, Comprehensive Zoning By-law Review, ON (2022 – Present): Project Manager/Strategic Advisor.** This project includes a review and development of a new Comprehensive Zoning By-law to achieve conformity with the County's Official Plan. Responsibilities include preparation of the Discussion Paper and Zoning Strategy Report, and leading the community engagement program for the project. Engagement activities include: workshops with municipal staff, Technical Review Committee meetings, and public open houses and workshops.

Development Approvals

- 2B Developments. 55 Craig Street Planning Rationale (2024 – Present): Lead Planner. Drafting a planning rationale in support of a Zoning By-law Amendment to enable the development of a residential apartment building on an infill site in Perth, Ontario.
- 2B Developments. 79 Wilson Street, Perth, ON (2024): Lead Planner. Conducted municipal policy and zoning analysis, and authored a Planning Rationale in support of a Zoning By-law Amendment for an affordable residential housing development.
- Caivan Communities. 141 Peter St., Perth, ON Official Plan Amendment, Zoning By-law Amendment, and Draft Plan of Subdivision Applications + OLT Appeal (2022 – ongoing) Strategic Advisor – Lead Planner. Providing strategic planning and lead Planner for all 3 applications, including authoring Planning Rationales, Town and County meetings to resolve issues, and supporting the Client with the OLT Mediation process and deliverables.
- Shepherds of Good Hope / CSV Architects. Site Plan Control Application. 1083-1095 Merivale Road, Ottawa, ON (2022 – Present): Strategic Advisor. Authored Planning Rationale and Scoped Design Brief in support of a 70-unit supportive housing development.
- Ottawa Community Housing / Diamond Schmitt Architects. Zoning By-law Amendment and Site Plan Control Applications. 200-201 Friel Street, Ottawa ON (2022 – 2023): Lead Planner. Supported the writing of the Planning Rationale in support of a Major Zoning By-law Amendment and Site Plan Control application for a 130-unit high-rise rental building. Presented in front of Planning and Housing Committee and successfully obtained municipal approvals.

JILL MACDONALD, MCIP, RPP

Senior Planner, Urban and Community Planning

Areas of practice

Land Use Planning & Policy

Land Development Approvals

Urban Design

Community Engagement

PROFILE

Jill MacDonald is a Senior Planner with six years of professional experience. Based out of the WSP Dartmouth office, she supports the delivery of various land use planning projects for both private and public sector clients primarily in Eastern and Northern Ontario, with support on projects in Atlantic Canada. Jill has expertise in coordinating development approvals applications, planning due diligence, planning policy and zoning reviews, and project coordination. She also has experience in coordinating municipal policy projects such as Official Plan and Zoning By-law Reviews, Secondary Plans, including their associated public engagement programs and Indigenous engagement.

Prior to joining WSP, Jill worked as a Junior Planner at Sterling Group, a small builder-developer located in Vaughan, Ontario, with focus on development of small to mid-scale residential and commercial projects in the Greater Toronto Area and southern Ontario.

EDUCATION

Bachelor of Environmental Studies (BES), Honours Planning (Co-op), Specialization in Urban Design, Faculty of Environment, University of Waterloo, Waterloo, ON	2017

PROFESSIONAL DEVELOPMENT

Working Effectively with Indigenous Peoples® – Certificate of Completion, Indigenous Corporate Training Inc.	2022
Data Sensitivity Training – Ministry of Natural Resources and Forestry's Natural Heritage Information Centre	2021

PROFESSIONAL ASSOCIATIONS

Full Member, Ontario Professional Planners Institute (OPPI), since 2022	OPPI
Full Member, Canadian Institute of Planners (CIP), since 2022	CIP

CAREER

Senior Planner, Urban and Community Planning, WSP, Dartmouth, NS	2026 – Present
Senior Planner, Urban and Community Planning, WSP, Ottawa, ON	2023 –2025
Project Planner, Urban and Community Planning, WSP, Ottawa, ON	2022 – 2023
Planner, Planning, Landscape Architecture, and Urban Design, WSP, Ottawa, ON	2021 – 2022
Junior Planner, Sterling Group, Vaughan, ON	2018 – 2020
English Teacher, École Sainte-Monique, Bordeaux, France	2019
Teaching Assistant, University of Waterloo, Waterloo, ON	2017
Planning Policy Assistant (Co-op), Planning and Innovation, Ministry of Municipal Affairs and Housing, Toronto, ON	2016
Architectural Conservation Assistant (Co-op), Acquisitions and Conservation Services, Ontario Heritage Trust, Toronto, ON	2016

PROFESSIONAL EXPERIENCE

Municipal & Community Planning

- Town of Marathon, Official Plan and Zoning By-law Review and Housing Needs Assessment, ON (2025 – Present): Project Manager / Senior Planner. This project involves the review of the Town's Official Plan for consistency with the Provincial Planning Statement, 2024, concurrently with the review of the Zoning By-law. Preparation of a Housing Needs Assessment for Marathon is also being undertaken concurrently with the Reviews.
- The County of Prince Edward, Comprehensive Zoning By-law Review, ON (2022 – 2025): Senior Planner. This project includes a review and development of a new Comprehensive Zoning By-law to achieve conformity with the County's Official Plan. Responsibilities include preparation of the Discussion Paper, Zoning Strategy Report, and Draft Comprehensive Zoning By-law, review of the County's site-specific Exception Zones, and supporting the community engagement program for the project. Engagement activities include: municipal staff review meetings, public open houses and meetings, and workshops.
- Loyalist Township, Amherstview West Secondary Plan and Municipal Class Environmental Assessment (MCEA), Amherstview, ON (2021 – 2025): Senior Planner. Co-led project coordination between technical teams and Township staff and with authoring the Public Engagement Program Strategy, Background Analysis Report, Growth Management Report, Secondary Plan, implementing Official Plan Amendment and Zoning By-law Amendment, and the MCEA Master Plan Report. Other responsibilities include coordination of community engagement events, including workshops, public open houses, and public meetings.
- Lanark County / SHS Consulting, Lanark County Municipal Opportunities and Tools for Affordable Housing, Lanark County, ON (2021 – 2022): Planner. Conducted a background review, prepared policy and zoning recommendations for the County's lower-tier municipalities, coordinated public and stakeholder consultation events, and assisted with the preparation of the Housing Study Report, including writing of draft County Official Plan policies.
- Municipality of North Grenville / SHS Consulting, North Grenville Housing Strategy, North Grenville, ON (2021 – 2022): Planner. Conducted a background review of current legislation, policy, zoning, and the role of housing partners in the Municipality and supported the authoring of the Housing Strategy Report.

Land Development

- Infrastructure Ontario. Provincial Government Uses, Preliminary Site Assessments for Multiple Sites, Eastern and Central Ontario (2023 – 2025): Senior Planner. Responsible for preparing Due Diligence Reports, Technical Analysis, and Site Fit Concepts for Site Selection.
- Shepherds of Good Hope / CSV Architects. Site Plan Control Application. 1083-1095 Merivale Road, Ottawa, ON (2022 – 2025): Senior Planner. Authored Planning Rationale and Scoped Design Brief in support of a 70-unit supportive housing development. Coordinated the submission of the Site Plan Control application.

- University of Ottawa / PCL Construction. Minor Zoning By-law Amendment and Site Plan Control Applications. 451 Smyth Road, Ottawa, ON (2023 – 2024): Senior Planner. Co-authored Planning Rationale and Zoning Confirmation Report in support of a six-storey post-secondary educational institution, the Advanced Medical Research Centre (AMRC), to be developed as part of the Ottawa Health Science Complex.
- Infrastructure Ontario. Planning Feasibility and Site Selection Study (2023 – 2024): Senior Planner. Due-diligence stage through to final Concept Plan design in support of planning four new Ontario Provincial Policy (OPP) detachments as part of modernization efforts in Central and Eastern Ontario. Phase 1 of this project involved completing a preliminary planning assessment, identifying opportunities and constraints as well as any necessary planning approvals, and completing a site selection exercise to recommend a preferred site and prepare a preliminary site fit concept. Phase 2 involved completing a detailed assessment of the preferred concept.
- Ottawa Community Housing / Diamond Schmitt Architects. Zoning By-law Amendment and Site Plan Control Applications. 200-201 Friel Street, Ottawa ON (2022 – 2023): Project Planner. Supported the writing of the Planning Rationale in support of Major Zoning By-law Amendment and Site Plan Control applications for a 130-unit high-rise mid-market rental building.
- Ellwood House / Cahdco. Zoning By-law Amendment and Site Plan Control Applications. 2262 Braeside Avenue, Ottawa, ON (2021 – 2023): Project Planner. Assisted with authoring the Planning Rationale in support of a 38-unit retirement home extension to Ellwood House and coordination of the Zoning By-law Amendment and Site Plan Control applications.
- Interval House / CSV Architects. Motion to Dismiss Appeal – Zoning By-law Amendment Application. 1525-1533 Goth Avenue, Ottawa ON (2023): Project Planner. Supported preparation of the affidavit in support of a Motion to Dismiss Appeal for an Ontario Land Tribunal Case Management Conference.

PUBLICATIONS

- Ontario Professional Planners Institute Y Magazine: Co-authored with Michael Flowers, P.Eng : “Tiny but mighty villages: Homes for Heroes Foundation’s approach to housing Veterans experiencing homelessness” (2022).

Appendix 7

Stormwater Memo and Report

MEMO

TO: Rémi Godin, P.Eng
Senior Area Engineer
Eastern Canada Area
rgodin@wm.com

2301 Carp Road
Ottawa, ON, K0A 1L0

FROM: Kathryn Kerker, P.Eng

Eeshan Kumar, P.Eng., P.E., PMP

SUBJECT: **West Carleton Environmental Centre – Stormwater Analysis for Proposed Maintenance Building**

DATE: **February 9, 2026**

The Stormwater Design Brief prepared in August 2015 by WSP Canada Inc. provides an analysis of the proposed site conditions and design of the stormwater management ponds and infiltration basins on site. A new 1027 m^2 maintenance building is proposed on land that was gravel-covered in the original design. The purpose of this memo is to verify that the existing stormwater infrastructure has the capacity to accept the additional flow from this new building. The original Stormwater Design Brief has been attached for reference.

DESIGN CRITERIA

The design criteria used in the original design of the stormwater management system are as follows:

- Internal ditches and stormwater structures: 1:25 year storm, with overland flow route to carry peak flow from 1:100 year storm
- Surface Water Quality Control: Stormwater ponds sized to store/treat runoff generated from a 4-hour, 25mm storm event.
- Surface Water Quantity Control: Control post-development peak flows to pre-development levels. However, as there is no off-site discharge from the central site area, this condition is automatically met.
- Infiltration Basins: At least 1m to bedrock and water table, and no more than 0.6m water storage depth.

STORMWATER MODELLING

Modelling was previously completed using Bentley PondPack. As we no longer have access to this software, modelling was replicated in PCSWMM to determine the impact of the added

impervious area on the overall stormwater management system. The PCSWMM model was calibrated to align with the PondPack results by adjusting CN values over the landfilled area for the 100-year 24-hour SCS Type II storm. PCSWMM model results are attached for reference.

The proposed maintenance building lies within catchment area A8, which was originally modelled with parameters as shown in Table 1. The new 1027 m^2 maintenance building will be placed on land that was previously gravel-covered, which leads to a slight increase in runoff coefficient and CN value. Under the proposed scenario, Catchment A8 was refined by separating the proposed maintenance building into its own subcatchment (A8_MB) to accurately reflect the updated impervious area assumptions. Runoff from the proposed building will be directed to Infiltration Basin #2 through a connection to the existing overflow pipe. Roof runoff is typically free of sediment and other pollutants, so the risk of clogging or contamination of the infiltration basin is low. At-grade runoff will be directed to SWM pond #2. Drainage mosaics for pre-development and post-development conditions are included at the end of this memo within the Drawings section.

Table 1: Catchment A8 model parameters

	Without Maintenance Building	With Maintenance Building
C	0.561	0.58
CN	85.7	86.1

As the maintenance building roof runoff will flow directly to the infiltration basin, catchment A8 was subdivided into to catchments. The parameters used in the PCSWMM model are shown in Table 2.

Table 2: Subdivided Catchment A8 Parameters

	Area (Ha)	Runoff Coefficient	CN
A8	2.69	0.57	85.7
A8_MB	0.11	0.90	98

RESULTS

INFILTRATION BASIN

The PCSWMM model was run with the 100-year 24-hour SCS Type II storm. Under existing conditions, the infiltration basin reaches a maximum depth of 0.59m, which remains unchanged under proposed conditions. This meets the design requirement of ponding less than 0.60m in the infiltration basin. Modelling results are shown in Table 3.

Table 3: PCSWMM Modelling Results

	Without Maintenance Building	With Maintenance Building
Maximum water depth in Infiltration Basin #2	0.590 m	0.590 m
Total runoff volume entering Pond #2	28800 m^3	28787 m^3
Peak runoff Subcatchment A8	0.582 m^3/s	0.594 m^3/s^*

*Sum of A8 and A8_MB hydrographs

As shown, there is no change to the maximum water depth in Infiltration Basin #2. The total volume entering Pond #1 slightly decreases due to the diversion of roof runoff directly to the infiltration basin. The increase in peak runoff from Subcatchment A8 is due to the added imperviousness as a result of the proposed building.

WATER QUALITY

The 25mm 4-hour Chicago storm event was run in the model under proposed conditions. The total volume reaching the pond during the water quality event is 256 m^3. As the pond has a permanent pool volume of 4200 m^3 and an extended detention volume of 19520 m^3, there is sufficient volume to store and treat runoff generated from a 4-hour, 25mm storm event.

The quality criteria outlined in the MOE SWM Planning and Design Manual were also assessed. Based on Table 3.2 of the manual and extrapolating for a 4.5% impervious contributing area, the pond also meets an enhanced 80% TSS removal protection level as shown in Table 4.

Table 4: Pond Water Quality Parameters

Parameter	Value
Contributing Area Imperviousness	4.5%
Contributing Area	52 ha
Storage Volume for Imperviousness Level	75 m^3/ha
Required Extended Detention Volume (40 m^3/ha)	2080 m^3
Available Extended Detention Volume	19520 m^3
Required Permanent Pool Volume (35 m^3/ha)	1820 m^3
Available Permanent Pool Volume	4200 m^3

CONVEYANCE

The existing ditches and stormwater infrastructure were verified to ensure that they still meet the design criteria with the additional flow from the new maintenance building. Figure 1 shows that the existing triangular ditch (1.1m deep, 3:1 side slopes) and 0.6 m culvert convey the 25-year storm without surcharging and convey the 100-year storm without overtopping.

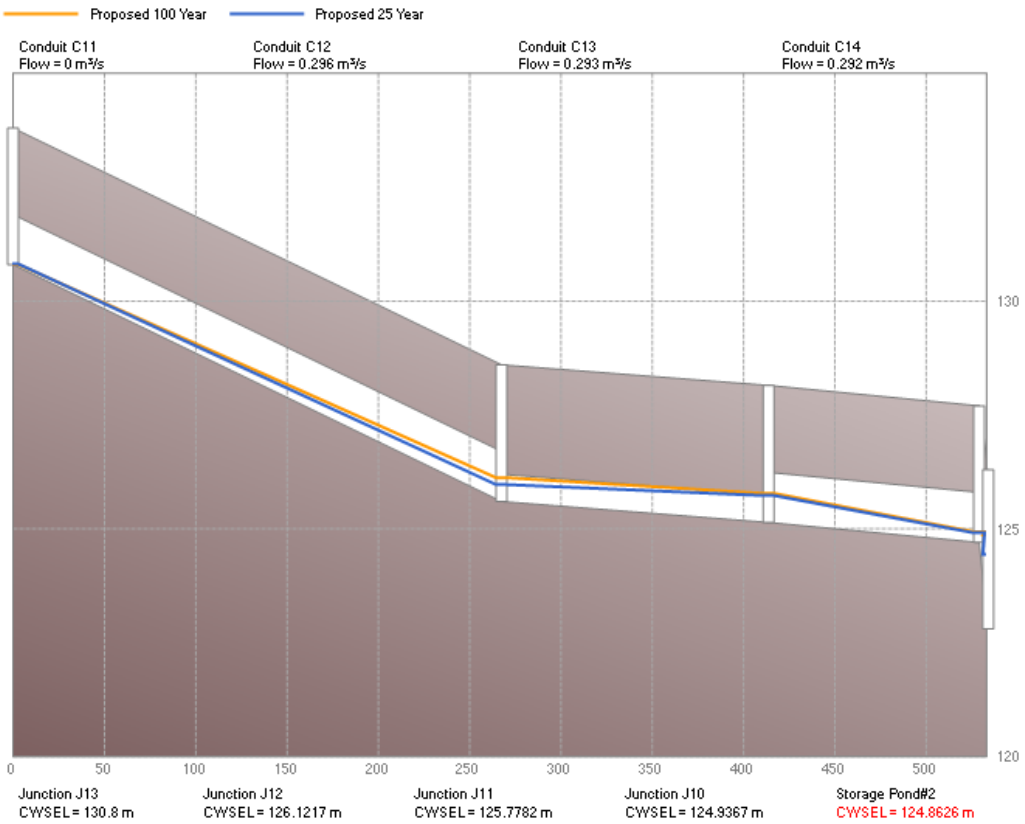


Figure 1: Hydraulic Grade Line along ditch and culvert adjacent to new maintenance building

Furthermore, under the updated grading and drainage concept, ditch flow south of Street A converges with the roadside ditch from Street B and is conveyed north to SWM Pond 2 within the same ditch system that also receives runoff from the area surrounding the future maintenance building. The design has been revised such that surface runoff in the vicinity of the future maintenance building is directed to the ditch east of Street D, rather than discharging directly to the infiltration basin overflow connection.

ALIGNMENT WITH CARP RIVER WATERSHED/SUBWATERSHED STUDY

The proposed maintenance building at the West Carleton Environmental Centre incorporates a stormwater management design in which all runoff is infiltrated on-site. This approach is consistent with the recommendations of the Carp River watershed/subwatershed study (Robinson, 2004), which emphasizes maintaining pre-development hydrologic conditions, minimizing surface runoff, and promoting infiltration to protect water quality and reduce downstream erosion. By ensuring complete infiltration, the project avoids contributing additional flows to the Carp River system, thereby preventing increases in peak discharge and pollutant loading, while maintaining a cool water thermal regime. Furthermore, infiltration supports the study's objective of sustaining groundwater recharge and baseflow contributions, which are critical to the ecological health and long-term stability of the watershed. In this way, the proposed building demonstrates compliance with the study's guidance and advances its broader goals of watershed protection and restoration.

CURRENT SYSTEM OPERATION

The construction of the stormwater ponds and infiltration basins began in 2023, and were not completed until late 2024 (See attached Environmental Assessment (EA) Compliance Monitoring Report). Monitoring of the water levels in the infiltration basin was done in Nov 2024, where it was found to be dry (excerpt from 2024 Annual Report attached). The ECA for the original SWM design is attached.

CONCLUSIONS

The peak depth in the infiltration basin, water quality treatment, and stormwater conveyance have all been confirmed to meet the design criteria. This memo has shown that the existing stormwater system is sufficient to support the proposed maintenance building.

We trust that the foregoing satisfies your current requirements. Should you have any questions regarding the above, please do not hesitate to contact our office.

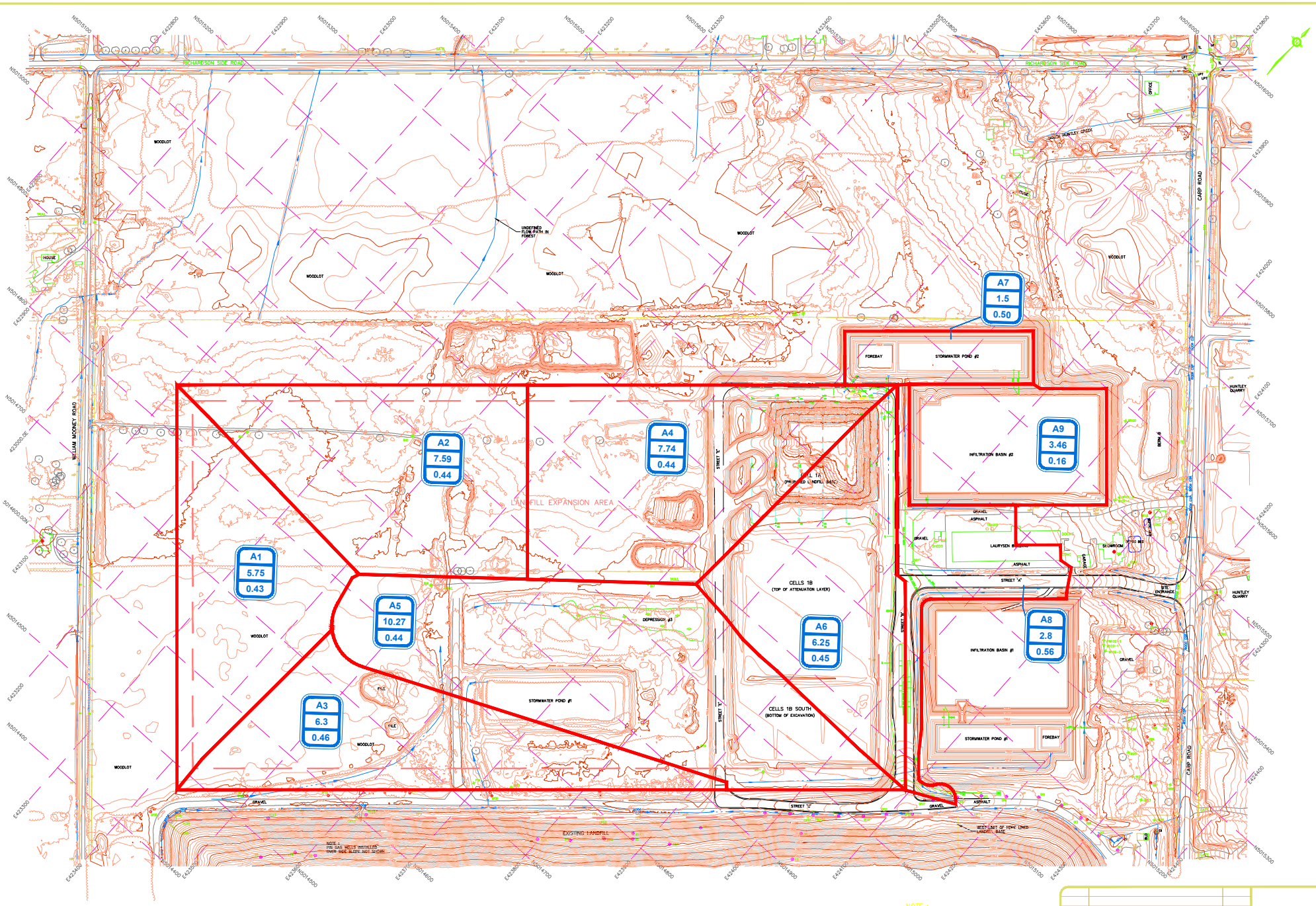
Sincerely,

Kathryn Kerker, P.Eng, M.A.Sc.
Water Resources Engineer

Eeshan Kumar, P.Eng., P.E., PMP
Senior Water Resources Engineer

ATTACHMENTS

- Proposed Maintenance Building Location and Drainage Area Plans
- Stormwater Design Brief, August 2015
- PCSWMM Model Output
- Waste Management of Canada Limited West Carleton Environmental Center Environmental Assessment (EA) Compliance Monitoring Report (CMR) for 2023
- WCEC 2024 Annual Report Excerpt
- Environmental Compliance Approval (June 2, 2016)



NOTE :
1. TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN ARE BASED ON FIELD SURVEY DATA OBTAINED BY TOMLINSON CONSTRUCTION TO MARCH 26, 2025

DATE	DESCRIPTION	
09\22\25	REVISION 1	REV1
04\08\24	ISSUED FOR CONSTRUCTION	COR

REVISION / ISSUE

Seal not valid unless signed & dated

WSP
96 KING STREET, SUITE 100
ST.CATHARINES, ONTARIO, CANADA L2R 3W6
TEL: 905-687-7717 | WWW.WSP.COM

DRAINAGE AREA PLAN
PRE-DEVELOPMENT CONDITIONS

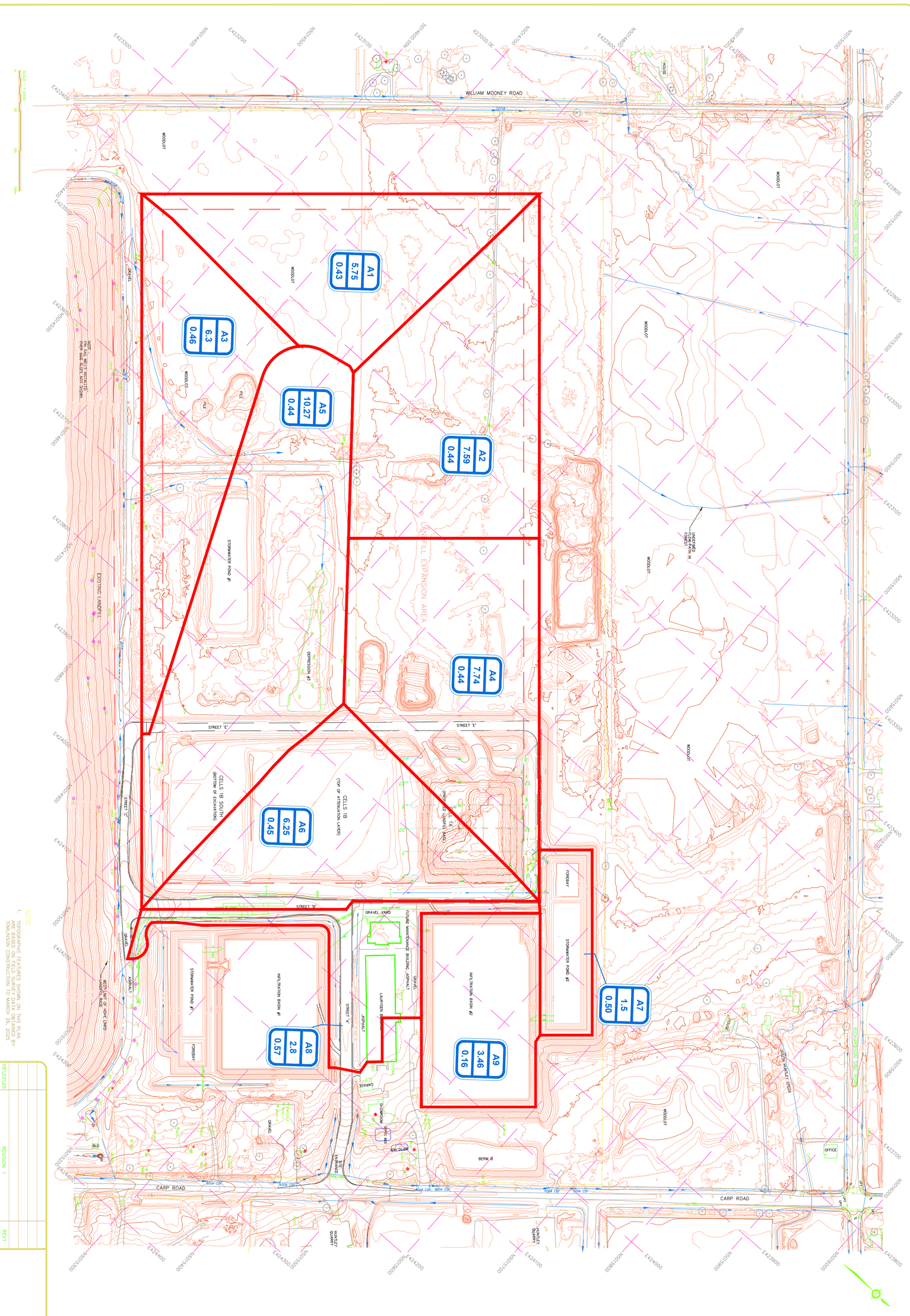
WEST CARLETON ENVIRONMENTAL CENTRE

DWN BY: N S
CHK BY: E K
DATE: SEPTEMBER 2025
SCALE: AS SHOWN

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO. CA0051319.2938 - 2502C

DRAWING
DAP1



NOTE:
1. PROPERTIES FEATURES SHOWN ON THIS PLAN ARE BASED ON FIELD SURVEY DATA OBTAINED BY TOMLINSON CONSTRUCTION TO MARCH 26, 2025

REVISION / ISSUE	DESCRIPTION	BY	DATE
1	ISSUED FOR CONSTRUCTION	COR	04\28\24
	REVISION 1	REVI	09\22\25

Seal not valid unless signed & dated

DRAWING
DAP2

DWN BY: N S DATE: SEPTEMBER 2025
CHK BY: E K SCALE: AS SHOWN

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO.
CA0051319.2938 - 2502C

DRAINAGE AREA PLAN
POST-DEVELOPMENT CONDITIONS

WEST CARLETON ENVIRONMENTAL CENTRE

wsp
55 KING STREET, SUITE 700
ST.CATHARINES (ONTARIO) CANADA L2R 3H5
TEL.: 905-687-1771 | WWW.WSP.COM

LEGAL DESCRIPTION:

INFO TAKEN FROM:

REGISTERED PLAN 5R-11322
PLAN OF SURVEY OF
PART OF THE SOUTH HALF
OF LOT 5
CONCESSION 3
GEOGRAPHIC TOWNSHIP OF
HUNTLEY
TOWNSHIP OF WEST CARLETON
FAIRHALL, MOFFATT & WOODLAND LTD.

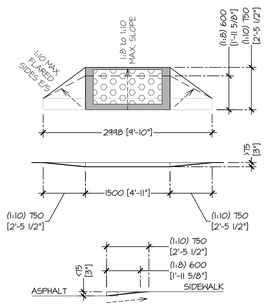
SITE LEGEND:

+ 00.00	- EXIST. GRADE ELEVATION
00.00	- PROPOSED GRADE ELEVATION
00.00	- PROPOSED DITCH ELEVATION
	- FLOW / DIRECTION
H	- HYDRO
STM	- STORM PIPE
SAN	- SANITARY PIPE
W	- WATER LINE
G	- GAS LINE
B	- BELL LINE
X	- FENCE
M.H.	- MAN HOLE
H.P.	- HYDRO POLE
LS	- LIGHT STANDARD
F.H.	- FIRE HYDRANT
C.B.	- CATCH BASIN
D.I.	- DITCH INLET
	- ACCESS / ENTRANCE
	- WATER LINE CURB STOP
	- SOD / GRASS / LANDSCAPE
	- EXISTING GRAVEL
#1	- DENOTES REVISION NUMBER

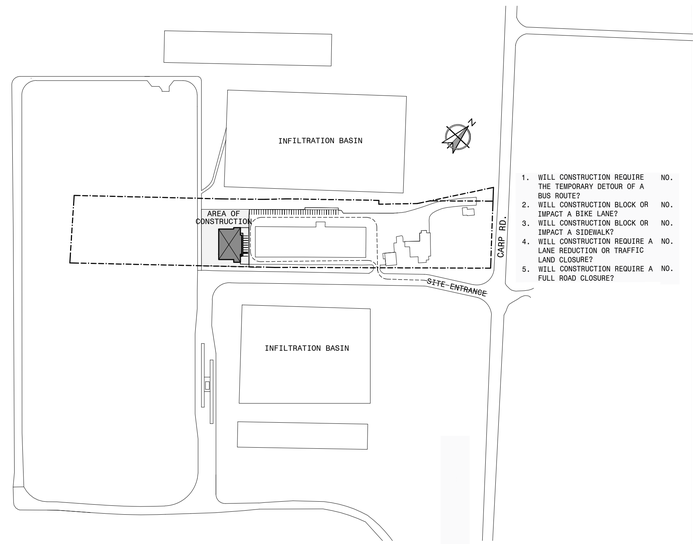
SITE STATISTICS:

ZONED :	RH Zone
MIN. PROPERTY AREA :	8,000 s.m.
PROPERTY AREA :	41,188 s.m.
NEW FACILITY AREA :	1,027 s.m.
EXISTING FACILITY AREA :	5,604 s.m.
TOTAL FACILITY AREA:	6,631 s.m.
LOT COVERAGE:	16.0 %
MAX LOT COVERAGE:	50 %
NEW BUILDING HEIGHT :	10.6 m.
MAX BUILDING HEIGHT :	15 m.
No. OF STOREYS :	-1-
MIN. FRONT YARD SETBACK :	15 m.
BLDG. FRONT SETBACK:	301.5 m.
MIN. INTERIOR SIDEYARD SETBACK :	3 m.
BLDG. MIN. INTERIOR SIDEYARD SETBACK:	4.9 m.
MIN. REAR YARD SETBACK :	15 m.
BLDG. REAR SETBACK:	175.5 m.
No. OF PROPOSED PARKING SPACES Shown :	9 SP.
No. OF BARRIER-FREE SPACES - INCL. :	1 SP.
No. OF REQUIRED PARKING SPACES	
0.75/100m2 HEAVY EQUIP.SERVICE:	8 SP.
0.8/100m2 LIGHT INDUSTRIAL EXISTING:	39 SP.
TYPICAL PARKING WIDTH	2.8 m.
TYPICAL PARKING LENGTH	6.0 m.

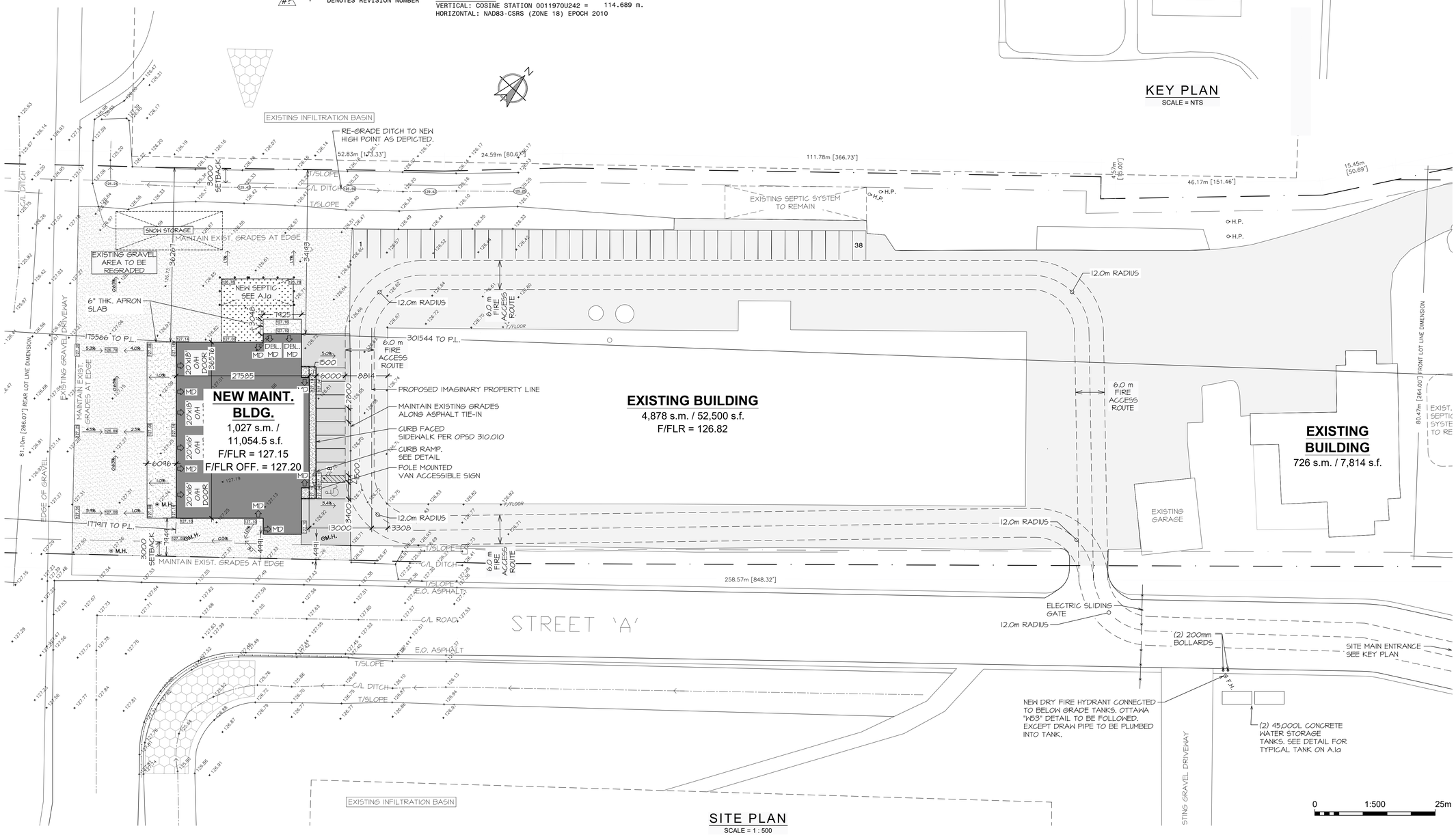
SITE BENCHMARKS:
VERTICAL: COSINE STATION 0011970U242 = 114.689 m.
HORIZONTAL: NAD83-CSRS (ZONE 18) EPOCH 2010



CURB RAMP @ EXTERIOR WALKS
3.8.3.2(3) Vertical Rise less than 75mm



KEY PLAN
SCALE = NTS



SITE PLAN
SCALE = 1 : 500

SITE PLAN NOTES:

1. ALL DIMENSIONS & NOTES MUST BE VERIFIED ON JOB SITE BY CONTRACTOR. ANY DISCREPANCIES SHALL BE REPORTED TO THE OWNER.
2. ALL UNDERGROUND WORK AND ABOVE GROUND WORK TO BE DONE IN ACCORDANCE WITH CURRENT CITY PLANS, STANDARDS & SPECS.
3. THE OWNER COVENANTS & AGREES NOT TO MAKE A MATERIAL CHANGE OR CAUSE A MATERIAL CHANGE TO BE MADE TO A PLAN, SPECIFICATION, DOCUMENT OR OTHER INFORMATION, ON THE BASIS OF WHICH THIS DRAWING WAS APPROVED BY THE CITY, WITHOUT NOTIFYING, FILING DETAILS WITH AND OBTAINING THE WRITTEN AUTHORIZATION OF THE CITY.
4. EXISTING ASPHALT.

   HEAVY DUTY ASPHALT:
   - 50mm HL8
   - 40mm HL8
   - 150mm (6") GRANULAR 'A', TYPE II
   - 300mm (12") GRANULAR 'B', TYPE I
5. ALL GRANULAR MATERIAL SHALL BE PLACED IN 300mm LIFTS AND COMPACTED TO 100% STANDARD PROCTOR.
6. INSTALL CONCRETE SIDEWALKS IN ACCORDANCE WITH OPSD-308.03 AND OPSD-303.04 FOR SIDEWALK RAMP.
7. SILT FENCE AS REQUIRED PER OPSD 219.110
8. GRASSED AREAS SHALL BE SOD AND 4" MINIMUM TOPSOIL. HYDROSEED FOR SLOPES EXCEEDING 4:1 SOD & STAKE.
9. CONTRACTOR SHALL OBTAIN A R.O.W. WORK PERMIT FROM THE CITY OF QUINTE WEST PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL ROAD ALLOWANCE.
10. UTILITY CUTS WITHIN THE MUNICIPAL ROAD ALLOWANCE TO BE RESTORED USING HEAVY DUTY ASPHALT STANDARDS.
11. CONNECTION OF ALL SANITARY AND STORM SEWERS TO CONFORM TO OPSD-1006.010
12. NO LIGHTING WILL BE DIRECTED ONTO ADJACENT PROPERTIES BUT WILL ONLY BE DIRECTED ONTO THE SUBJECT LANDS
13. ALL GURBING IN ACCORDANCE WITH OPSD - 600.110
14. BARRIER FREE SIGNAGE FOR PARKING AREA TO BE IN ACCORDANCE WITH OBC 3.8.3.1 (1)

OPSD REFERENCES

1. RIGID PIPE BEDDING, COVER AND BACKFILL OPSD - 802.030
   EXCEPT a) USE "CLASS B-BEDDING" DETAIL ONLY FOR ALL PIPE BEDDING. DELETE "CLASS C" - BEDDING" DETAIL.
   b) THE "GRANULAR BEDDING MATERIAL" IS TO BE GRANULAR 'A' CRUSHED MATERIAL.
   c) "COVER MATERIAL" IS TO BE SAND FILL
   d) DELETE "150 mm " FROM "NOTE 1" AND INSERT 225 mm FOR THE MINIMUM BEDDING DEPTH
   e) FOR A "WET TRENCH" CONDITION AS DETERMINED BY THE CITY ENGINEER;
      I) THE "GRANULAR BEDDING MATERIAL" IS TO BE AN "HL8 COARSE" GRADATION, CRUSHED LIMESTONE MATERIAL, AND
      II) THE "COVER MATERIAL" IS TO BE LIMESTONE SCREENINGS OR GRANULAR 'A' CRUSHED MATERIAL.
2. PRECAST CONCRETE MAINTENANCE HOLE, OPSD - 701.010
   1200 mm DIAMETER, EXCEPT USE PRECAST MONOLITHIC BASE ONLY.
3. MAINTENANCE HOLE STEPS, HOLLOW OPSD - 405.010
   EXCEPT DELETE "RECTANGULAR STAINLESS STEEL" STEP DETAILS. CAST IRON, SQUARE FRAME WITH CIRCULAR CLOSED OR OPEN.
4. COVER FOR MAINTENANCE HOLES OPSD - 401.010
   EXCEPT DELETE "TYPE 'B' OPEN COVER".
5. CAST-IN-PLACE MAINTENANCE HOLE DROP OPSD - 1003.010
   STRUCTURE TEE, EXCEPT THE INVERT OF THE INLET END OF THE 90 DEGREE BEND IS TO BE PLACED AT THE "SPRINGLINE" OF THE MAIN SEWER PIPE.
6. SEWER SERVICE CONNECTIONS FOR RIGID MAIN PIPE SEWER, EXCEPT; OPSD - 1006.010
   a) THE BEDDING AND COVER MATERIALS ARE TO BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH OPSD-802.030
   b) FACTORY MADE TEES OR WYES ARE NOT REQUIRED FOR SANITARY SERVICE CONNECTIONS TO THE MAIN SEWER PIPE UNLESS SPECIFIED.
7. CONCRETE SIDEWALK OPSD - 310.010
8. CONCRETE BARRIER CURB WITH WIDE GUTTER OPSD - 600.010
9. CONCRETE BARRIER CURB OPSD - 600.110

No.	DATE	REVISION(S)	BY
5	JAN.29/26	RE-ISSUED FOR SITE PLAN APPROVAL	ERB
4	DEC. 19/25	REVISED SEPTIC AREA	ERB
3	OCT. 14/25	ISSUED FOR TENDER	DGT
2	SEPT. 22/25	RE-ISSUED FOR SITE PLAN APPROVAL	ERB
1	AUG. 13/25	ISSUED FOR SITE PLAN APPROVAL	ERB

TaskForce Engineering Inc.
24 Newberry Street
Suite 201
Belleville, Ontario
K8N 3N3
Voice (613) 966-5600
Fax (613) 966-5701
www.taskforce-eng.com

NEW 11,054 s.f. BUILDING for
WASTE MANAGEMENT OF CANADA CORP
2413 CARP RD.
OTTAWA, ON

SITE PLAN AND DETAILS

DATE: JUNE 2025	CONTRACT No.: 0000
CHECKED BY:	DRAWING No.: A.1
DESIGNED BY:	
DRAWN BY: ERB	
SCALE: AS NOTED	

Stormwater Design Brief
West Carleton Environmental Centre

August 2015

Prepared for:
Waste Management of Canada Corporation
2301 Carp Road
Carp, Ontario K0A 1L0

Prepared by:
WSP Canada Inc.
1450 1st Avenue West, Suite 101
Owen Sound, Ontario N4K 6W2

Project No. 131-19416-00

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1. Introduction and Background

This report has been prepared in support of the Waste Management of Canada Corporation (WM) Site Plan Control application for a site expansion at the West Carleton Environmental Centre (WCEC). The Site Plan Control approval is required by the City of Ottawa before the proposed site development, in addition to the Environmental Compliance Approval (ECA) by Ontario Ministry of the Environment and Climate Change (MOECC). WM applied for an ECA approval in September 2014 and their application is under review.

Details of the proposed landfill expansion are outlined in the Development and Operations Report dated July 2014, by WSP Canada Inc.

1.1 Location

The WCEC is located adjacent to Carp Road and Highway 417, locally known as 2301 Carp Road, at the westerly end of Ottawa. The landfill site expansion is an extension of the existing Waste Management Facility, owned and operated by WM.

The WCEC is located on Parts of Lots 2, 3 and 4, Concession 2 and parts of Lots 3, 4 and 5, Concession 3, in the former Township of Huntley, formerly in the Township of West Carleton, now the City of Ottawa, near Carp Road and Highway 417. The existing landfill footprint occupies approximately 34 hectares (ha), bordered by the City of Ottawa Road 5 (Carp Road) on the east, Highway 417 on the south, William Mooney Road to the west and private lands south of Richardson Sideroad. Those lands between Richardson Sideroad and 300 m southerly, between William Mooney Road and Carp Road, are owned by WM, but are not designated as part of the site. The Contaminant Attenuation Zone (CAZ) part of the site consists of two (2) land parcels, one large parcel north of Highway 417 and the second small parcel south of Highway 417. **Figure 1-1** shows these lands and various facilities within the existing and proposed landfill site.

2. Stormwater Management

The stormwater management features of the landfill expansion are shown on **Drawing 4**. Sections through the stormwater ponds and infiltration basins are shown on **Drawings 9 and 10. Figure 8-1** shows the drainage areas before development of the landfill expansion. **Figure 8-2** shows how drainage and subdrainage areas are broken down and controlled after the development of the new landfill footprint. **Figure 8-3** provides details related to water storage facilities.

2.1 Existing Topography and Drainage

The natural topography on the area of WCEC property, which has been modified by aggregate extraction and waste disposal activities, ranges from an elevation of approximately 131 metres above sea level (masl) southwest of the landfill site to less than 110 masl on the Huntley Quarry property, east of Carp Road. The present landfill extends to an elevation of approximately 174 masl, and the Huntley Quarry has been mined to a floor elevation of less than 75 masl. Refer to **Figure 1-1** for the area conditions.

From within the boundaries of the existing landfill property, there is no direct off-site discharge of surface water that is in contact with waste that has been landfilled; internal surface water drainage is contained within the landfill property and is directed to on-site ponds, which are engineered, natural, or depressions remaining from aggregate extraction. The exceptions to this are the external slopes of the vegetated site perimeter berms along the east and south boundaries of the landfill property; this amount of surface water is very minor and is not in contact with activities at the landfill. Runoff from the vegetated berms flow into Carp Road and Highway 417 drainage systems. There is a small area of drainage from the extreme western end of the site, in the area of the existing service entrance which flows into the ditch along William Mooney Road and northward into the tributary of Huntley Creek.

The above noted tributary of Huntley Creek originates from the wetland west of William Mooney Road and west of the WCEC property. The wetland feeds a drainage course that collects surface water from the agricultural and residential properties along William Mooney Road, west of the WCEC property. Flowing from west to east under William Mooney Road the drainage course bends to the north and flows towards Richardson Sideroad. Along the south side of Richardson Sideroad, the creek is aligned as a roadside drainage ditch, flowing eastward to a point approximately 450 m east of William Mooney Road. Surface water from the agricultural land east of William Mooney Road and south of the Richardson Sideroad is controlled by drainage ditches and flows northward to the roadside ditch along Richardson Sideroad.

The Huntley Creek tributary then flows northward through a culvert under Richardson Sideroad. Here the creek collects drainage from the area north of Richardson Sideroad, including several residential and commercial/industrial properties. Approximately 250 m west of Carp Road, Huntley Creek flows in a southeasterly direction under Richardson Sideroad and bends towards the northeast, where it passes under Carp Road. From there, the creek flows eastward, parallel to Richardson Sideroad, then northward through a culvert under the road, eventually discharging to the Carp River, some 3.8 km northeast of the landfill property. Ditches along both sides of Carp Road between the landfill property and Richardson Sideroad also drain into this tributary.

Drainage south of the existing landfill is contained within a large wet forested area on the westerly end. The south central and southeasterly lands largely drain through a series of on-site stormwater ditching to a sedimentation pond and infiltration pond designated Stormwater Pond #2, which in turn discharges to the low lying area of Depression #1. The southerly part of the existing landfill at the easterly end drains to Depression #2 and recharges into the water table.

The stormwater flow pattern on the lands for the new landfill footprint can be divided into two (2) zones. On the south central and easterly part, surface flow is controlled by a series of ditches and Stormwater Pond #1, which recharges the water into the water table. Surface flow is generally from southwest to northeast. Because the east end of the property was used for aggregate extraction, the ground surface is lower than the surrounding area, and consequently there is no direct off-site surface water runoff from this area. A previous residential property is located beyond the eastern limit of the former extraction area, west of Carp Road. Surface water flow is northeast, following the slope of the land surface. On the north half of the property for the new landfill footprint, and the complete westerly part, is partially wooded and partially agricultural land. The southeast corner was a manufacturing facility (Laurysen Kitchens Limited). The western and north central part is flat lying, and surface drainage follows land contours and agricultural ditches in a northerly to northeasterly orientation toward Richardson Sideroad and into the tributary of Huntley Creek described previously. The eastern portion of the new lands for the landfill slopes, and has a northeasterly orientation along the edge of a post-glacial beach ridge. Surface drainage follows the land slope into ditches along Carp Road. These ditches drain northerly into the Huntley Creek tributary. West of the previous residential properties, a large depression from aggregate extraction remains, and designated as Depression #5 on **Figure 1-1**. Where the land surface in former extraction areas are depressed, surface water collects in localized ponds. The water level in the depressions reflects low flow groundwater table elevation.

There are no flood hazard zones located within the proposed landfill area. Elevated topography and high recharge potential on beach ridge deposits along Carp Road negate the potential for surface flooding.

2.2 Objectives

The general objectives of the stormwater management plan are as follows:

- control surface water draining on-site;
- control quality and rate of runoff discharging directly from the site to protect water quality and wildlife habitat and to prevent flooding within the South Huntley Creek watershed. Off-site discharge of surface water will be limited to the site perimeter and no offsite discharge from the existing and proposed waste fill areas will occur; and
- control sediment discharge and erosion during site operation and development.

Runoff from the landfill expansion area will drain into landfill perimeter ditching and pass through lined Stormwater Pond #2, where it will be settled before being discharged into Infiltration Basin #2. Runoff from the existing landfill footprint will be contained on-site in one of several depressions including new Infiltration Basin #1. These natural and manmade water storage facilities serve as groundwater recharge areas. Clean runoff from non-operating areas along the site perimeter will continue to drain off-site bypassing the above noted groundwater recharge areas.

The stormwater management plan complies with the MOE Landfill Standards. The design criteria for the site's stormwater facilities are as follows:

Internal Ditches and Stormwater Structures

- 1:25 year storm
- Provide overland flow route to carry peak flow from a 1:100 year storm.

Surface Water Quality Control

- Stormwater ponds sized to store/treat runoff generated from a 4-hour, 25-mm storm event.

Surface Water Quantity Control

- Control post-development peak flows from all storm events up to 1:100 year at or below pre-development levels. This applies only to the areas with direct off-site discharge along the site

boundary. There will be no off-site discharge from the central part of the site containing all waste disposal areas.

Infiltration Basins

The proposed infiltration basins are sized for 1:100 year storm event and in accordance with design criteria outlined in the MOE "Stormwater Management Planning and Design Manual" as follows:

- Depth to bedrock and water table – at least 1 m
- Water storage depth – no more than 0.6 m

The 1:100 year storm is the regulatory flood for Eastern Ontario (Zone 2), which includes the WCEC Facility.

2.3 Detailed Stormwater System Assessment

2.3.1 Pre-Development Conditions

Refer to **Figure 8-1** for the outline of the pre-development drainage areas. General hydrologic information concerning each drainage area is presented in **Table 8-1**.

The site is situated within the South Huntley Creek watershed which drains in an easterly direction north of the site. The South Huntley Creek is a tributary of Huntley Creek which in turn empties into the Carp River northeast of the site. South Huntley Creek is a permanent warm water system that has been significantly impacted historically by surrounding agricultural land use and roadways which have bisected its length into smaller reaches, separated generally by culverts. The South Huntley Creek watershed extends to the south of Highway 417 west of the site. The drainage divide runs near the south limit of the WM property just north of Highway 417. The lands draining south to Highway 417 belong to the Feedmill Creek watershed. Feedmill Creek is also a Carp River tributary. The active quarry on the east side of Carp Road locally influences drainage patterns.

The site is relatively flat with the exception of the existing landfill mound which rises approximately 40 – 45 m above the adjacent ground. Generally, the land slopes northeasterly and local drainage patterns are influenced by wetlands and manmade depressions (ponds, pits). These no outlet features serve as groundwater recharge areas and contribute to South Huntley Creek base flow. A portion of the groundwater flow is also drawn by the quarry east of the site.

As shown on **Figure 8-1**, the existing landfill footprint belongs to three (3) separate, no outlet Drainage Areas B, C and D. The existing Waste Transfer & Processing Facility (WTPF) in the southwest part of the site is located within Drainage Area E. The old aggregate extraction pit (Depression #5) forms another no outlet Drainage Area A. In total, on site, no outlet areas occupy 127.5 ha out of 188.3 ha under pre-development conditions. The remaining drainage areas (SH1 and SH2) discharge off-site to the South Huntley Creek and Drainage Area FD to the Highway 417 drainage system and ultimately to Feedmill Creek. A small portion of the site near the existing landfill entrance (Drainage Area F) drains into the quarry on the east side of Carp Road. Generally, drainage areas discharging off-site are located along the site perimeter and do not encroach waste fill or waste processing areas.

The site soil textures according to the Ontario Soil Map are classified as follows:

- Kg – Kars Gravely Sandy Loam Soil Group B
- Rs – Rubicon Sand Soil Group AB
- Li – Lyons Loam Soil Group B

These soils provide good drainage and are relatively permeable.

The Rational Method was used to determine peak flows using Ottawa rainfall intensity duration frequency (IDF) data. The design rainfall intensity was calculated in accordance with the formula:

$$i = A \times T_c^B$$

where i = rainfall intensity (mm/hr)
Tc = time of concentration (hr)
A, B = rainfall equation coefficients dependent on storm return frequency and meteorological station location.

The following runoff coefficients were used to calculate a cumulative runoff coefficient “C” for each drainage area:

- pavement/buildings - 0.9
- gravel areas - 0.55
- existing capped landfill – soil C - 0.45
- woods-soil B - 0.19
- pasture-soil B - 0.24
- pond, wetland - 0.05

- proposed landfill 5% slope – soil C/D - 0.42
- proposed landfill steep slope – soil C/D - 0.50
- lined stormwater pond - 0.5
- infiltration basin - 0.16

The time of concentration required to determine rainfall intensity in the Rational Method was calculated using the Kirpich Method. This method gives conservative, relatively short travel times as shown in **Table 8-1**.

In the Rational Method, peak flows for storms having a return period of more than ten (10) years were increased as follows:

- 1:25 year - 10%;
- 1:50 year - 20%; and
- 1:100 year - 25%.

2.3.1.1 Drainage Areas With No Off-Site Discharge

a) Drainage Area A

Drainage Area A, located in the northeast corner of the site, occupies approximately 10.08 ha. Surface water drains overland into Depression #5 which is an old, presently unused aggregate extraction pit. The west part of the existing Laurysen manufacturing facility and gravel yard west of the building belong to this catchment. Surface water flow is not channelized. The bottom of Depression #5 is at approximately 117.5 masl.

b) Drainage Area B

Drainage Area B is subdivided into two (2) subcatchments, B1 and B2. Catchment B1 collects stormwater from the north slope of the existing landfill. The landfill perimeter ditch directs stormwater to the existing Stormwater Pond #1 which overflows into the elongated natural wetland (Depression #3). Under high flow conditions Depression #3 may overflow into the rehabilitated old Dibbley Pit (Depression #4) which has a bottom elevation at approximately 122.0 masl. Sub-Area B2 drains directly into Depression #4.

Drainage Area B has a very large water storage capacity particularly within Depression #4 where the water level would have to rise more than 3 m before overflowing in a northerly direction. Drainage Area B encompasses 39.47 ha.

c) Drainage Area C

Drainage Area C is also subdivided into two (2) subcatchments, C1 and C2. Area C1 includes a large portion of the south slope of the existing landfill and lands to the south of the existing landfill. Sub-basin C2 collects runoff from the majority of the Closed South Cell including the poplar plantation and lands surrounding the Gas to Energy Facility. Area C1 drains via manmade ditch into existing Stormwater Pond #2. Under high flow conditions, this pond may overflow into adjacent Depression #1 which services sub-basin C2. Depression #1 also has substantial storage capacity and the water level may rise up to 124.5 masl (approximately 2 m) without overflowing. Drainage Area C encompasses 45.19 ha.

d) Drainage Area D

Drainage Area D includes the most easterly part of the existing landfill and the north section of the Closed South Cell. Stormwater drains into Depression #2 which lies south of the lined part of the existing landfill. Ground elevations range from 121.5 (bottom of Depression #2) to 170 masl at the top of the existing landfill mound. The area occupies 21.34 ha.

e) Drainage Area E

This 11.50 ha catchment in the southwest part of the site is very flat and mostly tree covered. Stormwater drains into the wetland inside the wooded area north of Highway 417. The existing waste transfer station is located within the slightly elevated west part of this area.

2.3.1.2 Drainage Areas Discharging Off-Site

a) Drainage Area F

This relatively small drainage area of 5.8 ha, on the west side of Carp Road near the existing landfill entrance, drains northerly along the roadside ditch which crosses Carp Road south of the existing Laurysen building entrance. Further downstream this channel enters Huntley Quarry. The 1:100 year peak flow at the Carp Road crossing is estimated at 0.99 m^3/s. This area has a higher level of imperviousness due to paved road surfaces within the Carp Road allowance and near the existing landfill entrance.

b) Drainage Area SH1

This large catchment of 41.35 ha occupies the northwest part of the site. Generally, it drains northerly towards South Huntley Creek through several channels. A large part of this area drains overland towards

Richardson Sideroad along an undefined flow path. Ditching north of the WTPF directs stormwater westerly across William Mooney Road where it joins the tributary of South Huntley Creek. In summary, stormwater outletting from this basin follows multiple pathways instead of a single concentrated channel.

The area is relatively flat with ground elevations varying from 127 masl in the south beside the existing landfill to 121.5 masl in the north near the property boundary. This basin includes a large woodlot and open field which is used for agricultural purposes.

c) Drainage Area SH2

Runoff from this area of 5.77 ha, located in the northeast corner of the site, drains northerly via roadside ditch along Carp Road into South Huntley Creek. This area includes the commercial/industrial strip on the west side of Carp Road including a large part of the Laurysen manufacturing facility. Generally land in this part of the site slopes easterly towards Carp Road. The Rational Method 1:100 year peak flow at the outlet of this area was calculated as 0.75 m^3/s.

d) Drainage Area FD

This small drainage area of 7.79 ha is situated along the southern property boundary and drains into the Highway 417 ditching system which ultimately discharges into the Carp River through Feedmill Creek east of the site. There is minimal direct off-site discharge from this catchment, generally limited to the external slopes of perimeter berms along the south and east boundaries of the landfill property.

2.3.2 Post-Development Conditions

Refer to **Figure 8-2** for the outline of the post-development drainage areas. Hydrologic parameters characterizing each catchment are shown in **Table 8-2**.

Post-development conditions are characterized by higher runoff coefficients and shorter travel times (time of concentration) due to steep landfill grades and flow channelization. These factors tend to increase peak flows but because the site design is based on no off-site discharge, peak flow attenuation is not an issue for the landfill development area. Runoff from the proposed landfilling area will be contained on-site in Infiltration Basin #2.

The existing Stormwater Pond #1 and small wetland (Depression #3) located within the landfill expansion area will be eliminated and replaced with new clay lined Stormwater Pond #1 and Infiltration Basin #1 within Depression #4. Similarly, Stormwater Pond #2 and Infiltration Basin #2 are proposed in the area designated

as Depression #5. Infiltration Basin #2 will service the entire landfill expansion area while Infiltration Basin #1 almost the entire north half of the existing landfill. The landfill expansion will shift drainage boundaries within Drainage Areas A and B, and in catchments located along the site perimeter (SH1, SH2 and F). Drainage patterns within the remaining part of the property will be hardly affected and generally will remain the same as under pre-development conditions. There will be a significant increase in the size of on-site no outlet areas to 151.76 ha from 127.48 ha under pre-development conditions. As a result, more stormwater will be contained on-site and recharged into groundwater and less discharged off-site as surface flow from lands located along the site perimeter.

Drainage Areas A and B were subdivided into small subcatchments for the purpose of hydrologic modelling which was used for sizing of the proposed stormwater storage facilities. Cumulative runoff coefficients and times of concentration were established in a similar fashion as those for the pre-development conditions. Runoff coefficient for the entire study area will increase to 0.35 from 0.29 before the development.

The following soil/land use CN curve numbers were used to establish cumulative CN value for each subcatchment within Drainage Areas A and B, which were subject to hydrologic modelling:

- pavement/buildings - 98
- gravel areas - 90
- existing capped landfill – soil C - 81
- pasture – native or imported soil B - 73
- lined stormwater pond - 85
- proposed landfill 5% slope – soil C/D - 81
- proposed landfill steep slope – soil C/D - 83
- infiltration basin - 70

All above values are for the average antecedent moisture conditions (AMC II).

2.3.2.1 Drainage Areas With No Off-Site Discharge

a) Drainage Area A

This drainage area was subdivided into nine (9) smaller sub-areas to facilitate hydrologic modelling. The overall size of the catchment will expand to 51.66 ha. The cumulative runoff coefficient was calculated as 0.432 in comparison to 0.29 prior to landfill expansion. The Rational Method 1:100 year peak flow at Pond #2 was calculated as 5.31 m^3/s.

Stormwater Pond #2 will control stormwater flows by providing temporary storage and treatment before releasing water into Infiltration Basin #2. All runoff originating from the landfill expansion area will be handled within this catchment. The proposed landfill will be graded such that all runoff from the mound will drain toward the landfill perimeter and be intercepted by the perimeter ditching. The ditching system will direct stormwater into Stormwater Pond #2. A large part of the on-site road network, including the main access road and scale house area, will be also routed through Stormwater Pond #2. Stormwater accumulating over the landfill base during base preparation as well as stormwater pools west of the lined area will be pumped to the perimeter ditching system, on an as required basis.

b) Drainage Area B

This watershed was also subdivided into multiple sub-areas to facilitate hydrologic modelling. Drainage Area B will be smaller, 22.58 ha down from 39.47 ha originally as a result of the proposed development. The northwest part of the catchment will be shifted into Drainage Area A and comprise part of the landfill footprint. The cumulative runoff coefficient increases to 0.398 from 0.32 prior to development. The overall CN number was estimated at 79.1 and the Rational Method 1:100 year flow at Pond #1 was calculated as 2.13 m^3/s.

Stormwater Pond #1 and Infiltration Basin #1 will function in the same fashion as stormwater storage facilities within Drainage Area A. New ditching will be provided on the west and south side of the existing landfill to intercept runoff coming from side slopes and direct it towards new Stormwater Pond #1. The south half of the main access road between two (2) mounds and the entire Mini-Transfer Area (MTA) are included within this drainage basin.

c) Remaining Drainage Areas

The size of Drainage Areas C, D and E will not change as a result of the landfill expansion as there is no major development planned for the south half of the WM property. Construction activities will be limited to the leachate treatment plant, contingency poplar plantation, road improvement (paving), extension of underground utilities and minor building improvements (blower building). These activities will have a negligible effect on the existing drainage patterns, and stormwater flows will remain the same as under pre-development conditions.

2.3.2.2 Drainage Areas Discharging Off-Site

a) Drainage Area F

The catchment boundary will be slightly realigned as a result of the landfill expansion with a minor reduction in size to 5.24 ha from 5.8 ha. The imperviousness level will increase with construction of the new access road off Carp Road and the Carp Road widening near the new entrance. This part of the site will also be subject to landscaping activities such as tree and bush planting, etc. The runoff coefficient for this area will increase by approximately 10% to 0.38. The 1:100 year peak flow will remain at the pre-development level of 0.99 m^3/s. This area will continue to discharge into the quarry east of the site.

b) Drainage Area SH1

The post-development size of this area will decrease to 18.44 ha down from 41.35 ha. For this reason there will be no increase in flows leaving the site. A decrease in size of this basin is a result of the proposed development; a portion of this area would become part of the landfill footprint.

Generally, this area extends near the limit of the development area and as such will not see major construction activities. Clearing and earthwork will be limited to the south and east catchment boundary. Landscaping and reforestation activities will take place within the westerly and northerly buffer area.

c) Drainage Area SH2

This area will not be heavily affected by the proposed development and its boundary will be slightly realigned because of interference with Infiltration Basin #2 and Stormwater Pond #2. Other project related activities will be limited to the Carp Road widening and minor landscaping work along the site boundary. Post-development size of this catchment will shrink to 5.06 ha down from 5.77 ha originally. The runoff coefficient remains unchanged at 0.36 after development. The 1:100 year flow was estimated as 0.66 m^3/s at the catchment outlet and is lower than under pre-development conditions.

d) Drainage Area FD

There will be no change in hydrologic characteristics of this area as there is no new development proposed within this part of the site.

2.3.3 Hydrologic Modelling

The Bentley Pondpack Version 8i computer program utilizing the SCS Unit Hydrograph Method was used for hydrologic modelling. A summary of the modelling procedure is outlined in **Appendix A**. Pondpack printouts for post-development conditions within Drainage Areas A and B are provided in **Appendix B**. The reader is referred to the same appendix for schematic of both catchments. **Tables 8-3 and 8-4** provide a comprehensive summary of the hydrologic modelling results. These results include rainfall data, flows, runoff volumes and coefficients, water levels, storage capacities and draining times.

The synthetic SCS Type II rainfall distribution for the 24-hour storm for the Ottawa meteorological station was used for hydrograph development with the following input parameters:

- size of drainage area;
- time of concentration;
- calibrated CN curve number; and
- constant infiltration rate of 12 mm/hr for both infiltration basins as recommended by the geotechnical investigation and hydrogeologist.

Default equations for time to peak and peak discharge of the hydrograph were used.

Hydrograph routing and addition in accordance with the drainage area schematic was carried out by the computer model. Stormwater ponds and infiltration basins were sized through an iterative process until they complied with the established design criteria. The Modified Puls Method was used for reach routing to account for hydrograph translation through the on-site ditching network.

It is interpreted that modelling results are conservative because simulated low frequency peak flows exceed those calculated manually with the Rational Method. For example, simulated 1:100 year flow at Pond #2 is 7.71 m^3/s, and is 45% higher than the same flow determined with the Rational Method. Similarly, runoff coefficients shown in **Table 8-3**, Column (7) for low frequency events are generally higher than the corresponding coefficients shown in **Table 8-2** even when accounting for the Rational Method peak flow increase factor for infrequent storms. For example, the simulated 1:100 year runoff coefficient for Catchment B is 0.533 and higher than the adjusted corresponding Rational Method coefficient of 0.498 (0.398 x 1.25) shown in **Table 8-2**. This indicates that the ponds are not undersized and that their storage capacities are adequate and conservative.

2.3.4 Stormwater System Infrastructure

2.3.4.1 Ditching

The overall layout of the proposed ditching system including invert elevations is shown on **Drawing 4**.

Ditching will be trapezoidal in the section with bottom width ranging from zero (triangular section) to 2 m depending on estimated flow. Schedule of ditch bottom widths is provided on **Drawing 4**. The highest flows will be in the landfill perimeter ditch draining into Stormwater Pond #2. The design 1:25 year flow for the south and north branches of the landfill perimeter ditch near Pond #2 inlet was calculated at approximately 1.8 m^3/s. Water depth under such flow in trapezoidal channel having a bottom width of 2 m and a slope of 0.5% would be 0.5 m which is less than the minimum ditch depth of approximately 1.1 m.

The landfill perimeter ditch will have an outer slope of 3H:1V (minimum) and an inner (landfill side) slope of 4H:1V (minimum) which is the same as the landfill side slopes. All other ditches will have side slopes not steeper than 3H:1V. Generally, the proposed ditches are relatively flat at grades around 0.5%. Flow velocity under such conditions for the 1:25 year storm event will be low at less than 1.0 m/s. Such velocities are suitable for grass lining which will assist in sediment filtering and erosion control.

Locally, ditching will be steeper and all ditches sloping at more than 3 to 4% will be rip rap lined with appropriately sized stone over geotextile. This includes ditching along the high access road having a grade of up to 8%. The rip rap lining will also be provided at all culvert ends, ditch inlets and at ditch alignment changes exceeding 45 degrees. Rip rap grouting may be used to further reduce erosion potential and washouts. Rock check dams will be installed along the long, steep ditch sections to reduce flow velocity.

Erosion control mats and sod may be used wherever establishment of vegetation cover is critical.

2.3.4.2 Storm Sewers and Culverts

Two (2) sections of storm sewers are part of the proposed drainage system. The first is 300 mm diameter overflow line for Infiltration Basin #1 discharging into Infiltration Basin #2. This line is provided in compliance with design guidelines which require overflow protection for infiltration basins. The line will not transmit any stormwater under normal conditions.

The second short section of storm sewer will service the mini-transfer drop-off area. This sewer line will be equipped with an isolation valve and Stormceptor unit to provide continuous treatment of total suspended solids as well as oil separation in case of an accidental spill upstream within the drop-off area. The above

noted system components will prevent pollution from reaching Stormwater Pond #1 and ultimately Infiltration Basin #1.

Corrugated steel pipe (circular and arch) will be used for culvert installation. Corrugated steel pipe arch (CSPA) is proposed under roads where increased depth of cover is required to withstand loadings from vehicular traffic. Concrete culverts are proposed at critical locations where heavy truck traffic is anticipated and where lighter pipe integrity could be in question.

All culverts were sized for the 1:25 year flow with sufficient spare capacity to allow for the 1:100 year flow to pass without overtopping ditch embankments.

2.3.4.3 Stormwater Ponds

Two (2) new stormwater ponds are proposed for surface water quality control in accordance with the MOE Landfill Design Standards. The ponds will attenuate peak flows but this function is not important since pre-treated stormwater discharges into the infiltration basin where it is recharged into the shallow groundwater system. The ponds outflow rates are controlled by recharge capacity of the shallow groundwater regime in the vicinity of the downstream infiltration facilities.

Stormwater pond dimensions and outlet pipe details are outlined on **Figure 8-3**. Hydrologic modelling results related to stormwater ponds are shown in **Table 8-3**. This table shows pond flows, volumes, water levels and drainage times. The ponds internal side slopes will be 4H:1V (minimum) and external side slopes 3H:1V (minimum). Each pond will consist of the following storage zones:

- permanent water pool, which includes sediment storage – between pond bottom and invert of the outlet pipe; and
- settlement zone – above invert of the outlet pipe.

The outlet pipe will be a relatively small diameter culvert (HDPE pipe) equipped with an isolation valve. A typical section for Pond #1 and Pond #2 are shown on **Drawing 9**. All ponds will be lined with a 600 mm clay liner. The pond base and side slopes up to 0.3 m above the normal water level will be covered with at least 150 mm of drainage gravel which will be placed over geotextile separator. The gravel layer will protect the underlying clay liner and serve as an indicator during sediment removal operations. In addition, drainage gravel will protect pond side slopes against wave action. The remaining portion of the internal side slopes will be topsoiled and vegetated. Fill placed within containment berms will consist of well compacted fine grained soils. In order to increase the infiltration contact area with native soils, fill material underlying the clay liner below the pond base will be composed of well compacted permeable granular

material (sand). All surficial, in-place loose fill will be removed down to native soil before any fill placement. A large quantity of such unsuitable material has been identified through the geotechnical investigation within Dibbley Pit (Depression #4). All of the above noted requirements are illustrated on Sections C, D and E, **Drawing 9**. The stability of pond side slopes has been assessed by the geotechnical engineer and found to be satisfactory under various operational scenarios.

The proponent may change the lining of the stormwater ponds and use geomembrane supported geosynthetic clay liner (GCL) instead of a conventional clay liner. This option would be decided based on economics and subject to a geotechnical slope stability assessment.

Each pond will be capable of settling particles larger than 40 microns even during major storm events. It was determined that both ponds will be capable of settling particles as small as 7 microns. A high sediment capture efficiency is caused by relatively low outflow rates. Refer to **Appendix A** for the theoretical size of settled particle calculations.

Both ponds have sufficient capacity to store/treat all runoff generated from the 25 mm storm event. This volume, as determined through hydrologic modelling, is 436 m^3 and 1,296 m^3 for Ponds #1 and #2 respectively and they are substantially lower than the corresponding permanent water pool volumes of 2,600 m^3 and 4,200 m^3 as is shown in **Table 8-3**.

Both ponds were sized with a relatively high length to width ratio exceeding 4:1.

A plunge pool (forebay) will be provided near each pond inlet to capture coarser suspended particles. The forebay will be 0.5 m deeper than pond bottom design elevation, providing additional sediment storage capacity. The forebay area will also be covered with drainage gravel and geotextile. Each pond inlet will be reinforced with rip rap. Accumulated sediment will be removed in accordance with criteria outlined in the Erosion and Sediment Control Plan, West Carleton Environmental Centre, WSP, March 2015. Removed sediment will be used as daily cover within the active disposal area.

A rip rap baffle across the pond width downstream of the inlet(s) is proposed to improve flow distribution, minimize short circuiting and to separate forebay from the more quiescent settling zone. Each pond will be equipped with a rip rap lined overflow spillway sized for the 1:100 year flow rate discharging into the downstream infiltration basin. Pond draining time will not exceed 48 hours.

2.3.4.4 Infiltration Basins

Infiltration facilities are designed to capture and retain runoff and allow it to infiltrate rather than discharge to surface water. This system has several benefits such as reducing surface runoff volume and pollutant discharge as well as augmenting low flow stream conditions and thus supporting wildlife habitat during low flow periods.

Subsurface exploration consisting of several borings was carried out to determine in-situ soil and groundwater conditions within the designated groundwater recharge areas. This work is summarized in the Supplemental Geotechnical Investigation by Alston Associates Inc. Refer to "Geotechnical Studies, West Carleton Environmental Centre" assembled in March 2015 by WSP. The permeability of soil from numerous samples collected within the footprint of infiltration facilities was estimated with the Hazen formula and ranged from 5×10^{-2} cm/s to 1.6×10^{-5} cm/s.

The constant rate infiltration rate of 12 mm/hr was selected for design in consultation with the hydrogeologist based on the observed local subsurface conditions. This rate was used as an input in hydrologic modelling and was used for sizing of both basins.

Groundwater recharge at infiltration facilities will result in the long term localized mounding of the shallow groundwater table. The maximum long term elevation of the shallow groundwater was determined by the hydrogeologist using "Modflow" groundwater flow computer model as follows:

- Infiltration Basin #1 – 120.81 masl
- Infiltration Basin #2 – 120.86 masl

Infiltration basin base elevations were selected to provide at least 1 m separation from the maximum predicted groundwater level.

Suspended solids loading in stormwater draining into each basin will be largely reduced by sedimentation taking place in both of the new stormwater ponds. This will control/reduce blinding and plugging of the basin base surface.

The following dimensions were established for the base of each infiltration basin:

- Infiltration Basin #1 – 116 x 158 m
- Infiltration Basin #2 – 118 x 217 m

Hydrologic modelling results including basin volumes, water levels and draining times are presented in **Table 8-4**. Maximum water storage under the 1:100 year design storm was calculated as 5,669 m^3 for Basin #1 and 15,530 m^3 for Basin #2. Each basin will have substantial additional capacity above the design water level which was calculated as follows:

- Infiltration Basin #1 – 19,573 m^3
- Infiltration Basin #2 – 28,062 m^3

This additional storage will provide a safety cushion in case of an extreme storm, heavier than the 1:100 year design event.

Sections of the infiltration basin are shown on **Drawings 9 and 10**. Imported, permeable fill will be required for construction of each basin. Permeable fill (sand having permeability ranging from 0.01 – 0.001 cm/s) will be placed loose over the scarified native soil following removal of all unsuitable loose fill material which was identified mainly within Infiltration Basin #1 area. Interior and exterior side slopes of infiltration basins will be 3H:1V. Fill placed within containment berms will consist of fine grained soil with the uppermost 600 mm consisting of the clay liner. Permeable material placed below the containment berms will be compacted to 98% SPMDD. Impermeable containment berms are required to ensure integrity and stability of fills when exposed to hydraulic gradients resulting from a sudden rise of water level. This requirement applies to the east and northeast berm in Infiltration Basin #2. The remaining banks of the basins constructed as fill or cut will not require the same treatment as exterior containment berms and engineered fill may be used at these locations. The reader is also referred to Sections C and D, **Drawing 9**, showing construction requirements along the boundary between infiltration basin and stormwater pond. All interior and exterior side slopes of infiltration basins will be topsoiled and vegetated, with the base remaining bare so it can be raked and scarified when needed. Permeable sand on the bottom of an infiltration basin will intercept silt, sediment and debris that could otherwise clog the base of the basin. The upper 50 – 100 mm of this sand layer can be readily restored following removal operations. Sand replacement material shall be of the same quality as originally installed material (hydraulic conductivity 1×10^{-4} to 1×10^{-5} m/s).

Rip rap lining for energy dissipation will be provided at all inlets into the basin for erosion control. All basins will also be equipped with an access ramp for maintenance access. Overflow spillways are provided in accordance with design guidelines to protect infiltration facilities against catastrophic failure from excessive rise in water level but due to the significant additional capacity within the basins are never anticipated to be used.

2.3.4.5 Operational Controls

Under normal conditions, isolation valves on the outlet piping from stormwater ponds will be open allowing water to drain by gravity into infiltration basins. These valves will be closed if contamination is suspected including the valve controlling drainage from the mini-transfer drop-off area.

Stormwater will flow into the ponds, deposit the coarse fraction of sediment in the forebay and settle smaller particles in the aft-bay section of the stormwater ponds before water is released into the infiltration basin.

In day-to-day operation, staff will visually monitor all stormwater ponds. Should contamination be suspected, testing of the stormwater pond's contents will be carried out by hand-held, on-site instrumentation to measure conductivity, pH and visual aesthetic conditions. Conditions present on site that might indicate the necessity to monitor the pond's contents could include the following:

- visible leachate seep to surface water flowing to one of the surface water ponds;
- evidence of dark stained water;
- oil or any other substance in amounts sufficient to create a visible film, sheen or foam on the receiving waters; or,
- accumulation of floating or settleable solids.

Refer to **Appendix C** for decision-making criteria related to regular and emergency operation of stormwater ponds. Stormwater quality criteria for field and laboratory sampling are also outlined in the same appendix.

The isolation valve on the outlet piping would be closed and remain closed when the pond's water quality is in question. A sample taken for further analysis would be placed in a "rush" category for reporting by an independent laboratory. If the stormwater does not satisfy the trigger concentrations then the stormwater contingency plan will be initiated. Refer to **Appendix C** for a list of contingency corrective actions.

The isolation valve controlling the mini-transfer area shall be closed immediately after spill detection and remain closed until satisfactory clean-up is completed and the area suitable for normal operations.

Depending on the type and severity of contamination, it may be desirable to remove accumulated sediment from the forebay and/or aft bay of the stormwater pond.

These procedures will allow control of surface water discharging into infiltration basins. Under normal conditions, surface water draining into infiltration facilities shall be deemed suitable for groundwater recharge.

Prepared by:

WSP Canada Inc.

Peter S. Brodzikowski, P. Eng.
Designated Consulting Engineer
Senior Environmental Engineer
PSB/dlw

Figures

RICHARDSON SIDEROAD

LANDS OWNED BY WASTE MANAGEMENT OF CANADA CORPORATION

SOUTH HUNTLEY CREEK

PROPERTY BOUNDARY (Typ)

PROPOSED NEW LANDFILL AREA

DEPRESSION #5

DEPRESSION #3

SWMF #1

DEPRESSION #4

LAND PROPOSED TO BE REZONED

PROPOSED NEW LOCATION FOR SITE ENTRANCE AND EXIT

HUNTLEY QUARRY

WILLIAM MOONEY ROAD

CARP ROAD

HIGHWAY 417

EXISTING LANDFILL

EXISTING ENTRANCE, SCALE AND OFFICE

CUMBERLAND READY-MIX

BIOSOLIDS STORAGE

DEPRESSION #2

EXISTING FLARE AND BLOWER BUILDING

LANDS SUBJECT TO SITE PLAN CONTROL

CLOSED SOUTH CELL

POPLAR FOREST

KARSON AGGREGATES

PROPERTY BOUNDARY (CAZ)

SWMF #2

DEPRESSION #1

LANDFILL GAS TO ENERGY BLD

HIGHWAY 417

PROPERTY BOUNDARY (CAZ)

NOTE :

1. TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN ARE BASED ON AERIAL PHOTOGRAPHY BY BASE MAPPING LIMITED FROM JULY 2007

SCALE : 1 : 12500

0 100 200 300 400 500m

P.S.B.	REVISION No. 1	JULY 31, 2015

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WASTE MANAGEMENT

SITE PLAN
SURROUNDING AREA

WEST CARLETON
ENVIRONMENTAL CENTRE

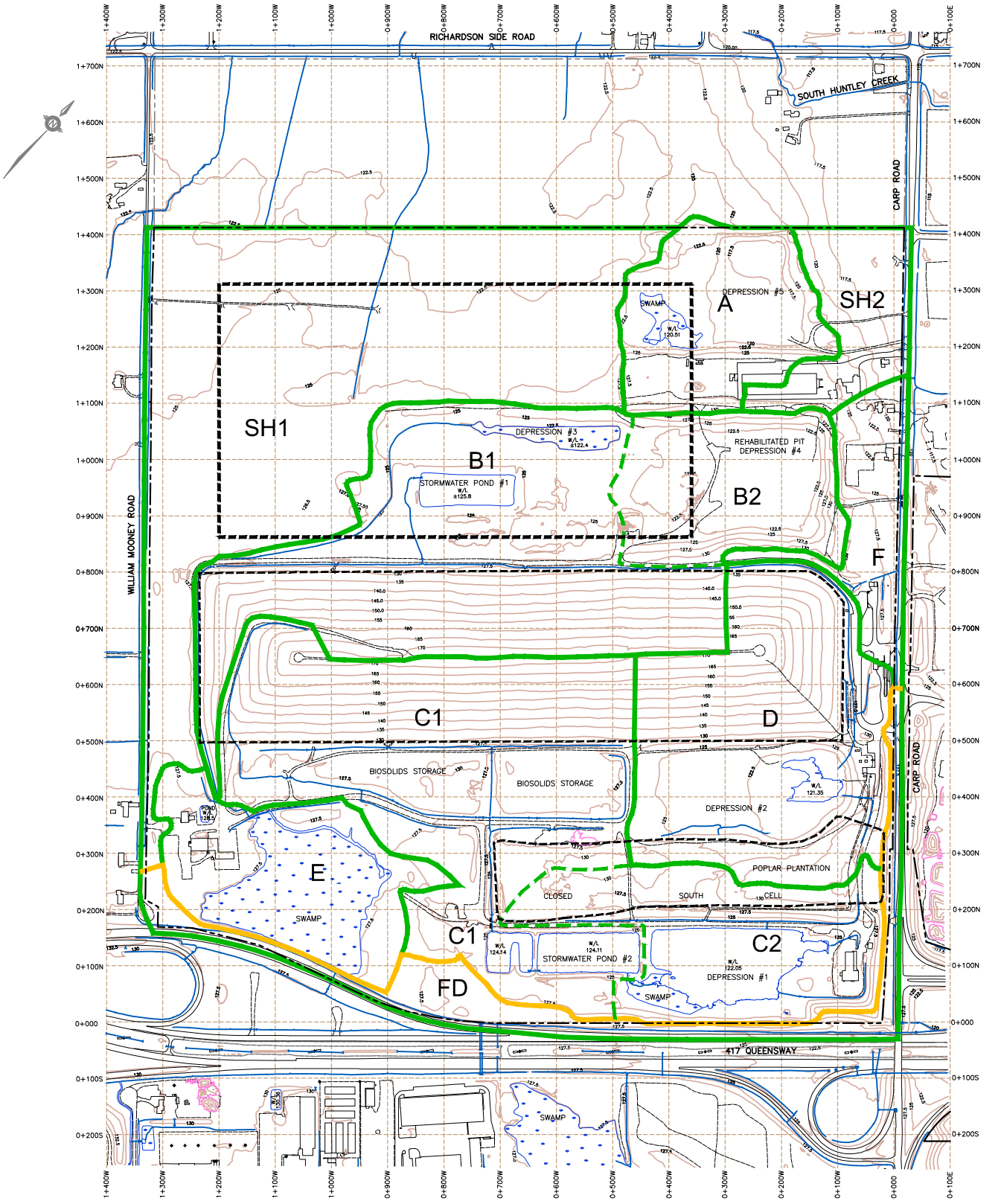
DWN BY: T C G
CHK BY: F C F

DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 - 1-1

FIGURE
1-1



LEGEND :

- LIMIT OF DRAINAGE AREA
- LIMIT OF SUBCATCHMENT AREA
- DIVISION BETWEEN FEEDMILL AND SOUTH HUNTLEY CREEK WATERSHEDS
- PROPOSED LANDFILL LIMIT
- WASTE MANAGEMENT OF CANADA PROPERTY LIMIT
- EXISTING LANDFILL LIMIT
- EXISTING GROUND CONTOURS

SCALE :1:10.000:

0 80 160 240 320 400m

FIGURE 8-1

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131-19416-00 - 8-1

PRE-DEVELOPMENT DRAINAGE AREAS

WEST CARLETON ENVIRONMENTAL CENTRE

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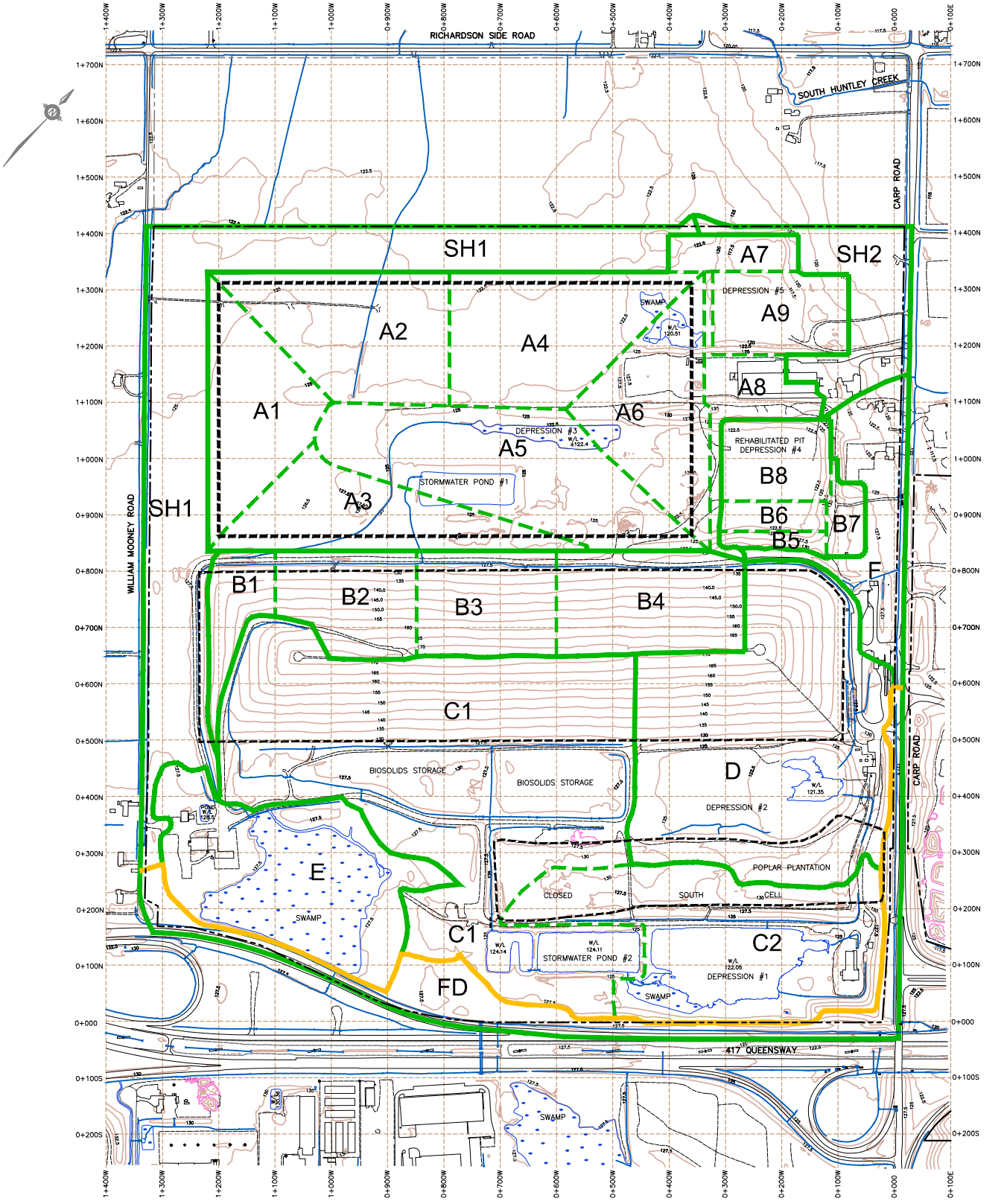

LEGEND :

- LIMIT OF DRAINAGE AREA
- LIMIT OF SUBCATCHMENT AREA
- DIVISION BETWEEN FEEDMILL AND SOUTH HUNTLEY CREEK WATERSHEDS
- PROPOSED LANDFILL LIMIT
- WASTE MANAGEMENT OF CANADA PROPERTY LIMIT
- EXISTING LANDFILL LIMIT
- EXISTING GROUND CONTOURS

SCALE :1:10.000:

0 80 160 240 320 400m

G:\2013\05\13-401 – Environmental\131-19416-00 – Ottawa Landfill Expansion\DRAWINGS FOR D&O\131-19416-00-8-2.dwg Jul 08, 2014 – 10:48am

FIGURE 8-2

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131–19416–00 – 8–2

POST-DEVELOPMENT DRAINAGE AREAS

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

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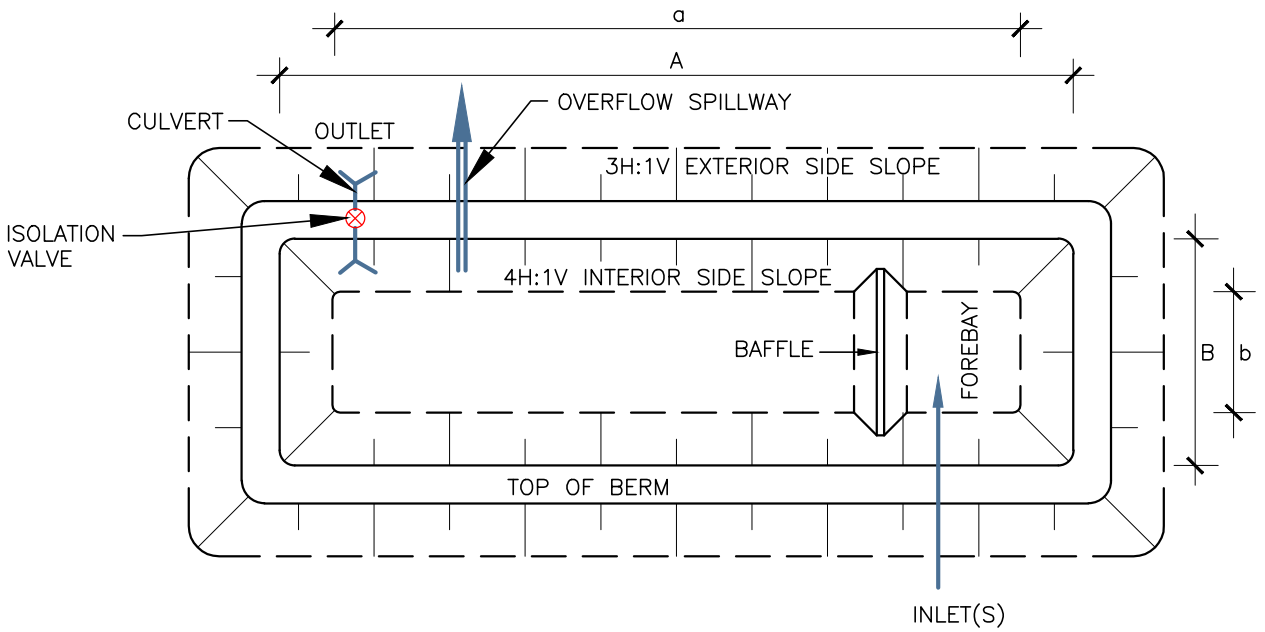

STORMWATER POND SCHEMATIC

SCALE: NTS

POND #	1	2
BOTTOM ELEVATION (m)	124.00	122.80
TOP OF BERM ELEVATION (m)	VARIES 126.75 – 129.00	VARIES 126.30 – 126.80
OUTLET PIPE NOMINAL ø (mm)	300	350
OUTLET INVERT UPSTREAM (m)	124.60	123.40
OUTLET INVERT DOWNSTREAM (m)	124.50	123.30
OVERFLOW SPILLWAY ELEVATION (m)	125.85	125.40
OVERFLOW SPILLWAY BOTTOM WIDTH (m)	3.0	6.0
a (m)	150	200
A (m)	184	228
b (m)	26	32
B (m)	51	62

NOTE :

ACTUAL INLET/OUTLET CONFIGURATION MAY VARY FROM THIS SHOWN HEREIN.

FIGURE 8-3

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: NTS

WASTE MANAGEMENT OF CANADA CORP.

DRAWING NO. 131–19416–00 – 8–3

STORMWATER POND SCHEMATIC

WEST CARLETON ENVIRONMENTAL CENTRE

WASTE MANAGEMENT

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Tables

TABLE 8-1
DRAINAGE AREA CHARACTERISTICS, PRE-DEVELOPMENT CONDITIONS
WM - WEST CARLETON ENVIRONMENTAL CENTRE

Drainage Area		Size [ha]		Time of Concentration (Tc) [(1)] [min]	Runoff Coefficient C		Rational Method Peak Flow Q_{100} [m^3/s]	Remarks
A		10.08		19	0.29		1.01	No outlet.
B	B1	39.47	29.41	35	0.32	0.34	2.30	No outlet.
	B2		10.06	10		0.25	1.34	No outlet.
C	C1	45.19	31.69	25	0.29	0.32	2.92	No outlet.
	C2		13.50	12		0.22	1.40	No outlet.
D		21.34		16	0.34		2.82	No outlet.
E		11.50		29	0.25		0.83	No outlet.
F		5.80		11	0.34		0.99	No outlet. Drains off-site to Huntley Quarry
SH	SH1	47.12	41.35	-	0.25	0.23	-	Multiple outlets to South Huntley Creek
	SH2		5.77	18		0.36	0.75	
FD		7.79		38	0.31		0.52	Drains to Feedmill Creek
TOTAL		**188.29**		**-**	**0.29**		**-**	

Notes:

(1) Tc established using Kirpich Method

TABLE 8-2
DRAINAGE AREA CHARACTERISTICS, POST-DEVELOPMENT CONDITIONS
WM - WEST CARLETON ENVIRONMENTAL CENTRE

Drainage Area		Size [ha]		Time of Concentration (Tc) [3] [min]		Runoff Coefficient C		Soil/Land Use Curve Number CN (AMC II)		Rational Method Peak Flow Q_{100} [m^3/s]		Remarks	
A	A1	51.66	5.75	32[1]	15	0.432	0.433	80.9	80.9	5.31[1]	1.01	No outlet	
	A2		7.59		15		0.435		81.2		1.34		
	A3		6.3		19		0.459		82.1		1.00		
	A4		7.74		19		0.435		81.1		1.17		
	A5		10.27		17		0.44		81.6		1.69		
	A6		6.25		15		0.45		81.4		1.14		
	A7		1.5		-		0.5		85		-		No concentrated flow
	A8		2.8		18		0.561		85.7		0.57		
	A9		3.46		-		0.16		70		-		No concentrated flow
B	B1	22.58	2.11	31[2]	11	0.398	0.412	79.1	79.6	2.13[2]	0.44	No outlet	
	B2		4.28		12		0.418		79.7		0.84		
	B3		4.67		14		0.42		79.9		0.84		
	B4		6.1		15		0.439		80.5		1.09		
	B5		0.64		6		0.24		72		0.12		
	B6		1.03		-		0.5		85		-		No concentrated flow
	B7		0.94		6		0.606		86.2		0.43		
	B8		2.81		-		0.16		70		-		No concentrated flow
C	C1	45.19	31.69	25		0.29	0.32	-		2.91		No outlet. No change.	
	C2		13.5	12			0.22	-		1.40		No outlet. No change.	
D		20.83		16		0.34		-		2.75		No outlet. No change.	
E		11.50		29		0.25		-		0.83		No outlet. No change.	
F		5.24		11		0.38		-		0.99		No outlet. No flow increase.	
SH	SH1	23.50	18.44	-		0.27	0.25	-		-		Multiple outlets. Drainage area reduced by 55%. Flow lower than under pre-development conditions.	
	SH2		5.06	18			0.36	-		0.66		Flow lower than under pre-development conditions.	
FD		7.79		38		0.31		-		0.52		No change.	
TOTAL		**188.29**		**-**		**0.35**		**-**		**-**			

Notes:

(1) Tc and Q_{100} at Pond 2

(2) Tc and Q_{100} at Pond 1

(3) Tc established using Kirpich Method

TABLE 8-3
HYDROLOGIC MODELLING RESULTS - STORMWATER PONDS (24-HR SCS II STORM)
WM - WEST CARLETON ENVIRONMENTAL CENTRE

Storm	Rainfall Depth [mm]	Post Development Conditions									
		Rainfall Volume [m^3]	Pond Peak Inflow [m^3/s]	Rational Method Pond Peak Inflow [m^3/s]	Runoff Volume [m^3]	Calculated Runoff Coefficient (6) / (3)	Peak Pond Outflow [m^3/s]	Maximum Water Level [mASL]	Maximum Water Storage excluding PWPV [m^3]	Total Pond Water Storage [m^3]	Draining Time After Storm [hr]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Drainage Area A (Pond #2) - 48.2 ha, Normal Water Level - 123.4 m, Permanent Water Pool Volume (PWPV) - 4,200 m^3											
1:2 yr	48.2	23,232	1.50	2.06	7,024	0.302	0.10	123.87	3,845	8,045	23
1:5 yr	63.8	30,752	2.94	2.65	12,177	0.396	0.15	124.25	7,247	11,447	31
1:10 yr	74.2	35,764	4.01	3.04	15,954	0.446	0.18	124.53	9,917	14,117	35
1:25 yr	87.3	41,206	5.46	3.88	20,988	0.509	0.22	124.88	13,609	17,809	40
1:50 yr	97.0	46,754	6.57	4.66	24,866	0.532	0.24	125.15	16,534	20,734	44
1:100 yr	106.6	51,381	7.71	5.31	28,805	0.561	0.26	125.40	19,543	23,743	48
Drainage Area B - (Pond #1) - 19.77 ha, Normal Water Level - 124.60 m, Permanent Water Pool Volume (PWPV) - 2,598 m^3											
1:2 yr	48.2	9,529	0.51	0.83	2,606	0.273	0.04	124.88	1,369	3,967	11
1:5 yr	63.8	12,613	1.07	1.06	4,617	0.366	0.08	125.08	2,444	5,042	14
1:10 yr	74.2	14,669	1.49	1.22	6,106	0.416	0.10	125.25	3,391	5,989	17
1:25 yr	87.3	17,259	2.08	1.55	8,104	0.469	0.12	125.47	4,720	7,318	20
1:50 yr	97.0	19,177	2.54	1.87	9,651	0.503	0.13	125.64	5,784	8,382	23
1:100 yr	106.6	21,075	3.00	2.13	11,226	0.533	0.15	125.81	6,890	9,488	25

TABLE 8-4
HYDROLOGIC MODELLING RESULTS - INFILTRATION BASINS (24-HR SCS II STORM)
WM - WEST CARLETON ENVIRONMENTAL CENTRE

Storm	Post-Development Conditions				
	Runoff Volume [m^3]	Maximum Water Level [mASL]	Maximum Water Storage [m^3]	Draining Time After Upstream Pond Empties [hr]	Capacity Up to Emergency Overflow Level [m^3]
(1)	(2)	(3)	(4)	(5)	(6)
Drainage Area A - Infiltration Basin 2 - Bottom 122.00, Overflow Spillway Level - 123.60 mASL					
1:2 yr	7,084	122.05	1,348	5	
1:5 yr	12,448	122.16	3,997	7	
1:10 yr	16,399	122.25	6,381	13	43,592
1:25 yr	21,680	122.38	9,827	24	
1:50 yr	25,760	122.48	12,612	32	
1:100 yr	29,909	122.59	15,530	40	
Drainage Area B - Infiltration Basin 1 - Bottom 123.00 - Overflow Storm Sewer Invert - 124.30 mASL					
1:2 yr	2,728	123.03	525	8	
1:5 yr	4,921	123.06	1,165	9	
1:10 yr	6,558	123.11	2,040	10	25,242
1:25 yr	8,767	123.18	3,370	15	
1:50 yr	10,484	123.24	4,484	18	
1:100 yr	12,238	123.31	5,669	23	

Note: Constant infiltration rate 12 mm/hr

Drawings

TRAPEZOIDAL DRAINAGE DITCH DIMENSIONS

FROM	TO	BOTTOM WIDTH (m)
DB1	DB2	1000
DB2	POND #2	2000
DB3	DB4	1000
DB4	POND #2	2000
DB5	DB6	1000
DB6	POND #1	2000

NOTE :
ALL OTHER DITCHES TO BE TRIANGULAR WITH SIDE SLOPES NO STEEPER THAN 3H : 1V

RICHARDSON SIDE ROAD

WILLIAM MOONEY ROAD

CARP ROAD

SOUTH MARLEY CREEK

HUNTLEY QUARRY

WOODLOT

TRAIL

HOUSE

UNDEFINED FLOW PATH IN FOREST

NEW 1.8m HIGH CHAINLINK FENCE ON PROPERTY LINE WITH NO TRESPASSING SIGNS

100m BUFFER (typ)

3.0m HIGH LITTER FENCE

10.0m HIGH LITTER FENCE

CLEANOUT (Typ)

DB1

DB2

DB3

DB4

DB5

DB6

GRAVEL

STORMWATER POND #2 (LINED) BOTTOM 122.60

SPILLWAY (Typ)

DEPRESSION #5

INFILTRATION BASIN #2 BOTTOM 122.00

DEPRESSION #3

STORMWATER POND #1

147.5 (GRADE BREAK)

JOIN TO EXISTING FENCE

TURNAROUND

ACCESS ROAD (PAVED)

ROCK CHECK DAM (Typ)

EXTEND UPWARDS ALL EXISTING INFRASTRUCTURE THAT IS TO REMAIN (MANHOLES, VALVE BOXES, MONITORING AND GAS WELLS). OVERHEAD HYDRO LINE TO BE RAISED/REPLACED AS REQUIRED.

LIMIT OF FILL

TOP OF FILL CONTOUR (Typ)

LIMIT OF CUT

NOTE
GAS WELLS INSTALLED OVER SIDE SLOPE NOT SHOWN

NOTE
LATERALS/SUBHEADERS OF GAS AND CONDENSATE COLLECTION SYSTEMS NOT SHOWN. ELECTRICAL CABLES SERVICING WELL PUMPS ARE NORMALLY IN COMMON TRENCH WITH CONDENSATE PIPING AND ARE ALSO NOT SHOWN.

EXISTING LANDFILL

WEST LIMIT OF HDPE LINED LANDFILL BASE

PAVED ROAD TO WASTE TRANSFER STATION

PROVIDE 1.2m HIGH RUNOFF DIVERSION BERM ON EAST SIDE OF PROPOSED DITCH

OVERFLOW

LAURYSEN BUILDING MAINTENANCE BUILDING

SHOWROOM

SCALE HOUSE

SCALE (2)

REHABILITATED PIT DEPRESSION #4

INFILTRATION BASIN #1 BOTTOM 123.00

ACCESS ROAD (PAVED)

ENTRANCE GATE

REGION EXISTING DITCH

PROPOSED ROAD WIDENING

RETAINING WALL

BANK SWALLOW PROTECTION AREA

STORMWATER POND #1 (LINED) BOTTOM 126.00

INSPECTION LAYBY AREA

CONNECT TO EXISTING DITCH @137.40

MATCH EXISTING WIDENED ROAD @118.75

RELOCATE PORTION OF AIR INJECTION SYSTEM INTERFERING WITH MRF TRANSFER AREA

NEW 1.8m HIGH CHAINLINK FENCE STARTS HERE

SCALE : 1:2000

0 50 100 150 200m

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WM WASTE MANAGEMENT

PROPOSED FINAL LANDFILL CONTOURS

WEST CARLETON ENVIRONMENTAL CENTRE

DWN BY: T C G
CHK BY: P S B

DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO. 131-19416-00 - 4

DRAWING 4

LICENSED PROFESSIONAL ENGINEER
P.S. BRODZIKOWSKI
PROVINCE OF ONTARIO

G:\2013\GS\13-401 - Environmental\131-19416-00 - Ottawa Landfill Expansion\DRAWINGS FOR DWG\STAMPED DRAWINGS TO MINISTRY JULY 2014\131-19416-4.dwg Aug 07, 2014 - 8:36am

SECTION A
GRID LINE 1+090N
4
SCALES
1 : 2000 HORIZONTAL
1 : 300 VERTICAL

SECTION B
GRID LINE 0+800W
4
SCALES
1 : 2000 HORIZONTAL
1 : 300 VERTICAL

SECTION C
GRID LINE 0+250W
4
SCALES
1 : 500 HORIZONTAL
1 : 100 VERTICAL

SECTION D
GRID LINE 0+250W
4
SCALES
1 : 500 HORIZONTAL
1 : 100 VERTICAL

SECTION E
GRID LINE 1+300N
4
SCALES
1 : 500 HORIZONTAL
1 : 100 VERTICAL

DATE	DESCRIPTION
	REVISION / ISSUE

LICENSED PROFESSIONAL ENGINEER
P.S. BRODZIKOWSKI
PROVINCE OF ONTARIO
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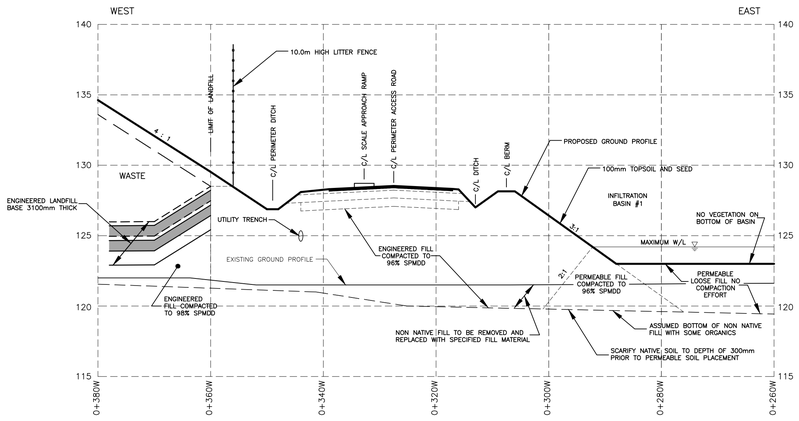
WASTE MANAGEMENT

SECTIONS

WEST CARLETON ENVIRONMENTAL CENTRE

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE
DRAWING NO. 131-19416-00 - 9

DRAWING 9



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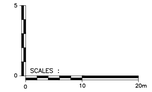
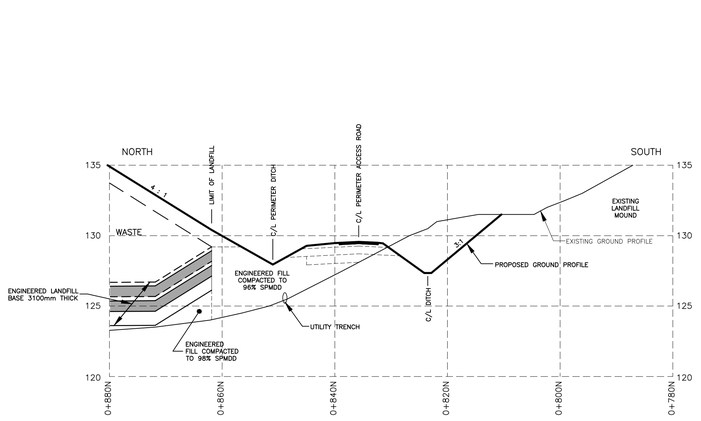
GRID LINE 1+000N
SCALES
1 : 500 HORIZONTAL
1 : 200 VERTICAL





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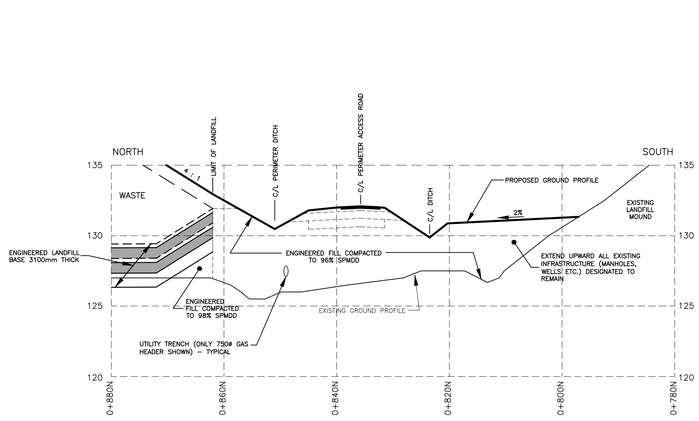

SECTION H
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SCALES
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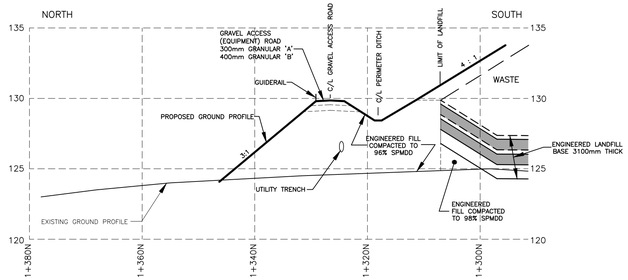
1 : 200 VERTICAL



SECTION J
GRID LINE 1+100W
SCALES
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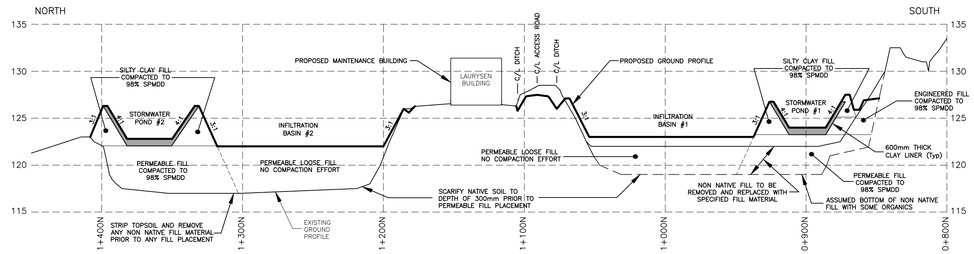
1 : 200 VERTICAL



SECTION K
GRID LINE 0+200W
SCALES
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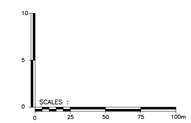
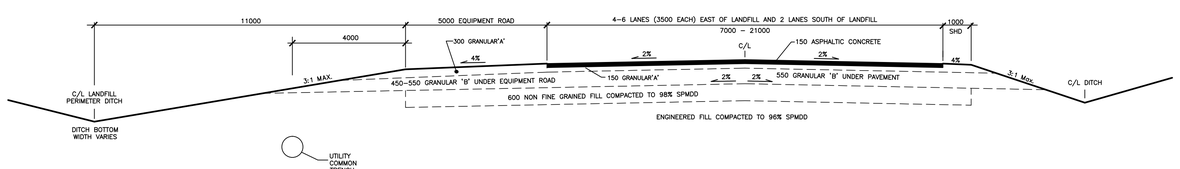
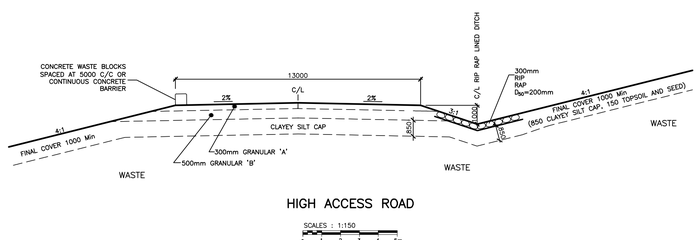
1 : 300 VERTICAL



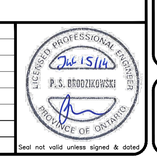


PERIMETER LANDFILL ACCESS ROAD DETAIL



HIGH ACCESS ROAD

DATE	DESCRIPTION
	REVISION / ISSUE



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WASTE MANAGEMENT

SECTIONS

WEST CARLETON ENVIRONMENTAL CENTRE

DWN BY: T C G
CHK BY: P S B
DATE: JULY 2014
SCALE: SEE BAR SCALE

WASTE MANAGEMENT OF CANADA CORPORATION

DRAWING NO. 131-19416-00 - 10

DRAWING 10

G:\2013\GS\13-401 - Environmental\131-19416-00 - Ottawa Landfill Expansion\DRAWINGS FOR D&O\STAMPED DRAWINGS TO MINISTRY JULY 2014\131-19416-10.dwg Jul 09, 2014 - 11:54am

Appendices

Appendix A

Summary of Modelling Procedure

Appendix A

Stormwater Modelling Procedure Summary

Hydrologic modelling of the stormwater management system is limited to the post development conditions because there will be no off-site discharge from lands encompassing waste disposal area. All runoff originating from landfilling areas will be diverted to infiltration basins and recharged into subsurface groundwater regime.

Post Development Conditions

1. Establish drainage network schematic for each infiltration basin watershed.

2. Define input parameters for SCS Unit Hydrograph Method used by Bentley PondPack model. These include the following parameters:

    a) Subwatershed area.
    b) Time of concentration for each subwatershed which is established within PondPack model using Kirpich equation. This method is conservative and provides relatively short times.
    c) CN curve number for each watershed. Cumulative CN value was established for each subwatershed from conservatively selected CN values corresponding to various applicable land cover features.

3. Enter geometric information for drainage channels as required for hydrograph routing by Modified Puls Method.

4. Establish stormwater pond and infiltration basin dimensions. Use constant infiltration rate of 12 mm/hour recommended by a hydrogeologist for sizing of both infiltration basins.

5. Size outlet structures including emergency overflows for all water storage facilities.

6. Run PondPack model for 24 hour SCS storm (2 to 100 year return period). Verify peak flows and check water levels at each water storage location to ensure compliance with design criteria.

7. Optimize size of water storage facilities and fit them into the overall site design.

In addition to PondPack Modelling, the Rational Method was used to calculate peak flows for all subwatersheds using the following input parameters:

a) subwatershed area;
b) runoff coefficient C;
c) time of concentration (Kirpich Method)
d) rainfall intensity i calculated from Ottawa Intensity Duration Frequency (IDF) data.

The peak flow increase factor was applied to all storms having a return period of more than 10 years. Rational Method peak flows were used for sizing of all proposed culverts.

Settling Velocities for Lined Ponds

Formula to calculate settling velocity is:

$$V_s = \frac{1.2\ Q}{A}$$

Q - is 1:100 year peak pond outflow

A - is water surface area in pond at top of settlement zone i.e. invert of culvert outlet

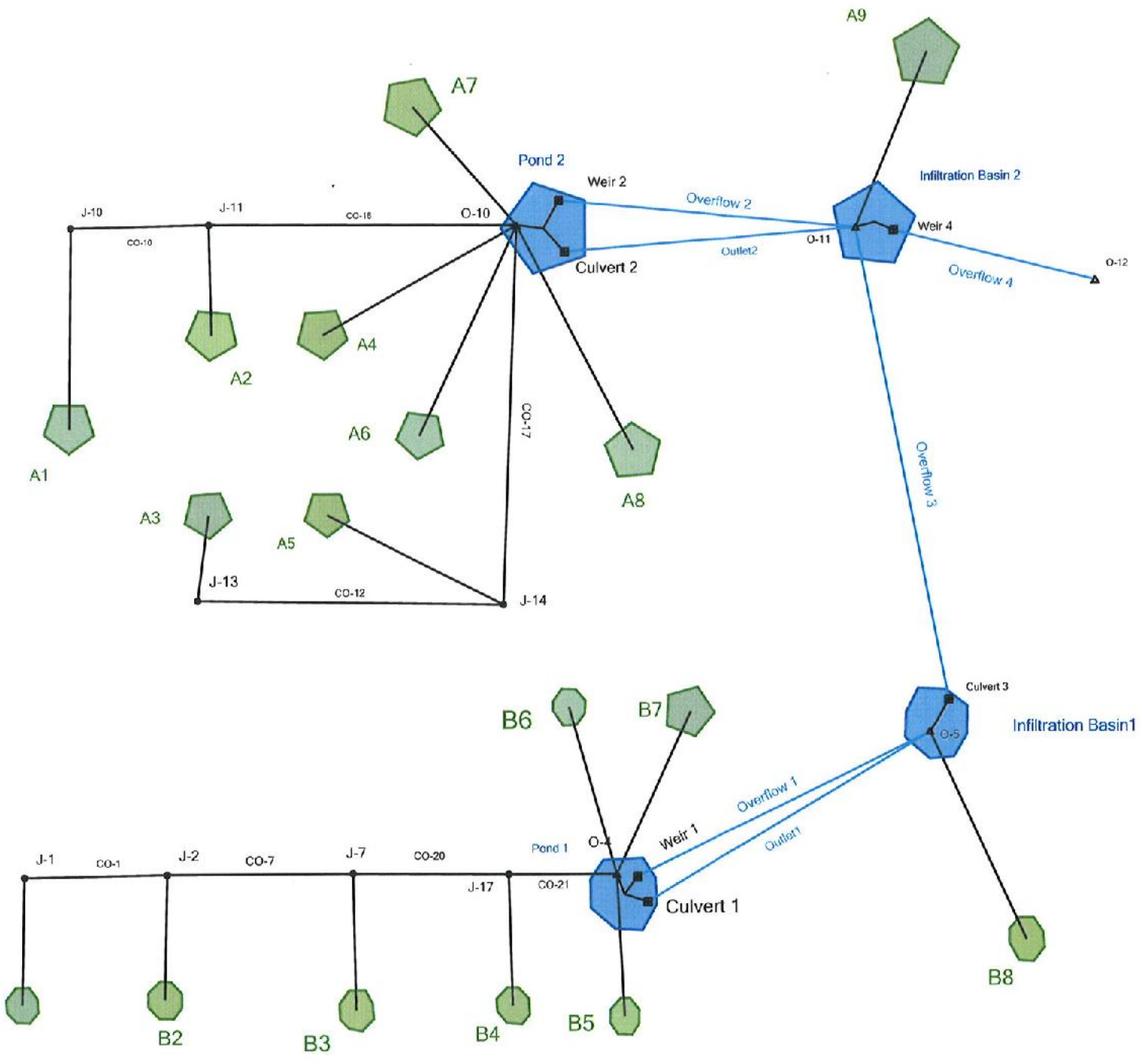
The table below shows calculation results including size of settled particles corresponding to settling velocity V_s

Pond #	Settled Particle Size [Microns]	Q [m^3/s]	A [m^2]	Top of Settlement Zone Elevation [masL]	Calculated V_S [m/s]
1	7	0.15	4,768	124.6	3.78×10^{-5}
2	7	0.26	7,537	123.4	4.14×10^{-5}

Appendix B

Pondpack Printouts – Drainage Areas A & B Post Development

Scenario: Post-Development 1



Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (m^3)	Time to Peak (hours)	Peak Flow (m^3/s)
B1	Post-Development 1	1	39.304	4.000	0.01
B1	Post-Development 2	2	260.430	12.050	0.09
B1	Post-Development 5	5	469.578	12.000	0.17
B1	Post-Development 10	10	625.463	12.000	0.23
B1	Post-Development 25	25	835.319	12.000	0.30
B1	Post-Development 50	50	998.254	12.000	0.36
B1	Post-Development 100	100	1,164.530	12.000	0.42
B2	Post-Development 1	1	81.099	4.000	0.02
B2	Post-Development 2	2	532.187	12.050	0.18
B2	Post-Development 5	5	957.761	12.050	0.33
B2	Post-Development 10	10	1,274.768	12.000	0.44
B2	Post-Development 25	25	1,701.333	12.000	0.60
B2	Post-Development 50	50	2,032.357	12.000	0.72
B2	Post-Development 100	100	2,370.120	12.000	0.84
B3	Post-Development 1	1	91.633	4.000	0.02
B3	Post-Development 2	2	589.981	12.050	0.19
B3	Post-Development 5	5	1,057.917	12.050	0.35
B3	Post-Development 10	10	1,405.903	12.050	0.48
B3	Post-Development 25	25	1,873.697	12.050	0.64
B3	Post-Development 50	50	2,236.521	12.050	0.76
B3	Post-Development 100	100	2,606.481	12.050	0.89
B4	Post-Development 1	1	132.466	4.000	0.03
B4	Post-Development 2	2	806.832	12.050	0.25
B4	Post-Development 5	5	1,431.332	12.050	0.47
B4	Post-Development 10	10	1,893.604	12.050	0.63
B4	Post-Development 25	25	2,513.233	12.050	0.84
B4	Post-Development 50	50	2,992.779	12.050	1.00
B4	Post-Development 100	100	3,481.132	12.050	1.16
B6	Post-Development 1	1	43.523	4.000	0.01
B6	Post-Development 2	2	188.590	11.950	0.08
B6	Post-Development 5	5	310.749	11.950	0.13
B6	Post-Development 10	10	398.220	11.950	0.16
B6	Post-Development 25	25	513.158	11.950	0.21
B6	Post-Development 50	50	600.799	11.950	0.25
B6	Post-Development 100	100	689.175	11.950	0.28
B5	Post-Development 1	1	1.699	4.000	0.00
B5	Post-Development 2	2	40.691	12.000	0.01
B5	Post-Development 5	5	86.904	12.000	0.03
B5	Post-Development 10	10	123.801	11.950	0.05
B5	Post-Development 25	25	175.536	11.950	0.07
B5	Post-Development 50	50	216.907	11.950	0.09
B5	Post-Development 100	100	260.005	11.950	0.11
B8	Post-Development 1	1	2.605	4.000	0.00
B8	Post-Development 2	2	145.039	12.000	0.04
B8	Post-Development 5	5	328.872	12.000	0.12

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (m^3)	Time to Peak (hours)	Peak Flow (m^3/s)
B8	Post-Development 10	10	478.810	12.000	0.18
B8	Post-Development 25	25	691.781	11.950	0.27
B8	Post-Development 50	50	863.720	11.950	0.35
B8	Post-Development 100	100	1,043.816	11.950	0.42
A3	Post-Development 1	1	176.301	4.000	0.04
A3	Post-Development 2	2	939.128	12.100	0.26
A3	Post-Development 5	5	1,620.856	12.100	0.47
A3	Post-Development 10	10	2,119.459	12.100	0.63
A3	Post-Development 25	25	2,782.781	12.100	0.82
A3	Post-Development 50	50	3,293.334	12.100	0.98
A3	Post-Development 100	100	3,811.363	12.100	1.13
A5	Post-Development 1	1	266.065	4.000	0.06
A5	Post-Development 2	2	1,474.826	12.100	0.43
A5	Post-Development 5	5	2,566.979	12.050	0.78
A5	Post-Development 10	10	3,368.714	12.050	1.04
A5	Post-Development 25	25	4,437.816	12.050	1.39
A5	Post-Development 50	50	5,262.091	12.050	1.65
A5	Post-Development 100	100	6,099.392	12.050	1.91
A6	Post-Development 1	1	156.932	4.000	0.03
A6	Post-Development 2	2	884.477	12.050	0.28
A6	Post-Development 5	5	1,544.741	12.050	0.50
A6	Post-Development 10	10	2,030.176	12.050	0.67
A6	Post-Development 25	25	2,678.094	12.050	0.89
A6	Post-Development 50	50	3,177.971	12.050	1.05
A6	Post-Development 100	100	3,686.004	12.050	1.22
A1	Post-Development 1	1	133.316	4.000	0.03
A1	Post-Development 2	2	783.839	12.050	0.25
A1	Post-Development 5	5	1,380.814	12.050	0.45
A1	Post-Development 10	10	1,821.396	12.050	0.61
A1	Post-Development 25	25	2,410.811	12.050	0.81
A1	Post-Development 50	50	2,866.316	12.050	0.96
A1	Post-Development 100	100	3,329.778	12.050	1.11
A2	Post-Development 1	1	184.626	4.000	0.04
A2	Post-Development 2	2	1,058.116	12.050	0.33
A2	Post-Development 5	5	1,854.329	12.050	0.61
A2	Post-Development 10	10	2,440.572	12.050	0.81
A2	Post-Development 25	25	3,223.760	12.050	1.07
A2	Post-Development 50	50	3,828.438	12.050	1.27
A2	Post-Development 100	100	4,443.225	12.050	1.48
A4	Post-Development 1	1	185.334	4.000	0.04
A4	Post-Development 2	2	1,070.547	12.100	0.30
A4	Post-Development 5	5	1,879.389	12.100	0.55
A4	Post-Development 10	10	2,475.374	12.100	0.73
A4	Post-Development 25	25	3,271.983	12.100	0.97
A4	Post-Development 50	50	3,887.223	12.100	1.15

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (m^3)	Time to Peak (hours)	Peak Flow (m^3/s)
A4	Post-Development 100	100	4,512.912	12.100	1.33
A7	Post-Development 1	1	63.373	4.000	0.01
A7	Post-Development 2	2	274.673	11.950	0.11
A7	Post-Development 5	5	452.532	11.950	0.19
A7	Post-Development 10	10	579.957	11.950	0.24
A7	Post-Development 25	25	747.310	11.950	0.31
A7	Post-Development 50	50	874.962	11.950	0.36
A7	Post-Development 100	100	1,003.662	11.950	0.41
A9	Post-Development 1	1	3.228	4.000	0.00
A9	Post-Development 2	2	178.594	12.000	0.05
A9	Post-Development 5	5	404.959	12.000	0.15
A9	Post-Development 10	10	589.557	12.000	0.22
A9	Post-Development 25	25	851.827	11.950	0.33
A9	Post-Development 50	50	1,063.524	11.950	0.43
A9	Post-Development 100	100	1,285.273	11.950	0.52
B7	Post-Development 1	1	46.468	4.000	0.01
B7	Post-Development 2	2	186.891	11.950	0.08
B7	Post-Development 5	5	302.339	11.950	0.13
B7	Post-Development 10	10	384.373	11.950	0.16
B7	Post-Development 25	25	491.580	11.950	0.20
B7	Post-Development 50	50	573.048	11.950	0.23
B7	Post-Development 100	100	655.025	11.950	0.27
A8	Post-Development 1	1	129.776	4.000	0.02
A8	Post-Development 2	2	538.133	12.100	0.16
A8	Post-Development 5	5	877.114	12.050	0.27
A8	Post-Development 10	10	1,118.799	12.050	0.34
A8	Post-Development 25	25	1,435.324	12.050	0.44
A8	Post-Development 50	50	1,676.159	12.050	0.51
A8	Post-Development 100	100	1,918.721	12.050	0.58

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (m^3)	Time to Peak (hours)	Peak Flow (m^3/s)
J-1	Post-Development 1	1	39.304	4.000	0.01
J-1	Post-Development 2	2	260.430	12.050	0.09
J-1	Post-Development 5	5	469.578	12.000	0.17
J-1	Post-Development 10	10	625.463	12.000	0.23
J-1	Post-Development 25	25	835.319	12.000	0.30
J-1	Post-Development 50	50	998.254	12.000	0.36
J-1	Post-Development 100	100	1,164.530	12.000	0.42
J-2	Post-Development 1	1	120.403	4.000	0.03
J-2	Post-Development 2	2	792.617	12.050	0.23
J-2	Post-Development 5	5	1,427.339	12.050	0.46

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (m^3)	Time to Peak (hours)	Peak Flow (m^3/s)
J-2	Post-Development 10	10	1,900.230	12.050	0.62
J-2	Post-Development 25	25	2,536.651	12.050	0.84
J-2	Post-Development 50	50	3,030.610	12.050	1.01
J-2	Post-Development 100	100	3,534.650	12.050	1.18
J-7	Post-Development 1	1	212.037	4.050	0.05
J-7	Post-Development 2	2	1,382.598	12.100	0.36
J-7	Post-Development 5	5	2,485.256	12.100	0.72
J-7	Post-Development 10	10	3,306.162	12.050	0.99
J-7	Post-Development 25	25	4,410.349	12.050	1.36
J-7	Post-Development 50	50	5,267.132	12.050	1.65
J-7	Post-Development 100	100	6,141.131	12.050	1.95
J-10	Post-Development 1	1	133.316	4.000	0.03
J-10	Post-Development 2	2	783.839	12.050	0.25
J-10	Post-Development 5	5	1,380.814	12.050	0.45
J-10	Post-Development 10	10	1,821.396	12.050	0.61
J-10	Post-Development 25	25	2,410.811	12.050	0.81
J-10	Post-Development 50	50	2,866.316	12.050	0.96
J-10	Post-Development 100	100	3,329.778	12.050	1.11
J-11	Post-Development 1	1	317.942	4.000	0.07
J-11	Post-Development 2	2	1,841.954	12.100	0.53
J-11	Post-Development 5	5	3,235.143	12.050	0.98
J-11	Post-Development 10	10	4,261.969	12.050	1.33
J-11	Post-Development 25	25	5,634.571	12.050	1.78
J-11	Post-Development 50	50	6,694.754	12.050	2.13
J-11	Post-Development 100	100	7,773.003	12.050	2.49
J-13	Post-Development 1	1	176.301	4.000	0.04
J-13	Post-Development 2	2	939.128	12.100	0.26
J-13	Post-Development 5	5	1,620.856	12.100	0.47
J-13	Post-Development 10	10	2,119.459	12.100	0.63
J-13	Post-Development 25	25	2,782.781	12.100	0.82
J-13	Post-Development 50	50	3,293.334	12.100	0.98
J-13	Post-Development 100	100	3,811.363	12.100	1.13
J-14	Post-Development 1	1	442.337	4.000	0.09
J-14	Post-Development 2	2	2,413.955	12.100	0.64
J-14	Post-Development 5	5	4,187.835	12.100	1.18
J-14	Post-Development 10	10	5,488.173	12.100	1.58
J-14	Post-Development 25	25	7,220.569	12.100	2.11
J-14	Post-Development 50	50	8,555.425	12.100	2.50
J-14	Post-Development 100	100	9,910.783	12.100	2.91
O-12	Post-Development 1	1	0.000	0.000	0.00
O-12	Post-Development 2	2	0.000	0.000	0.00
O-12	Post-Development 5	5	0.000	0.000	0.00
O-12	Post-Development 10	10	0.000	0.000	0.00
O-12	Post-Development 25	25	0.000	0.000	0.00
O-12	Post-Development 50	50	0.000	0.000	0.00

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (m^3)	Time to Peak (hours)	Peak Flow (m^3/s)
O-12	Post-Development 100	100	0.000	0.000	0.00
J-17	Post-Development 1	1	344.474	4.050	0.08
J-17	Post-Development 2	2	2,189.430	12.100	0.49
J-17	Post-Development 5	5	3,916.588	12.100	1.04
J-17	Post-Development 10	10	5,199.766	12.100	1.45
J-17	Post-Development 25	25	6,923.582	12.100	2.00
J-17	Post-Development 50	50	8,259.911	12.100	2.42
J-17	Post-Development 100	100	9,622.263	12.100	2.85

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (m^3)	Time to Peak (hours)	Peak Flow (m^3/s)	Maximum Water Surface Elevation (m)	Maximum Pond Storage (m^3)
Pond 1 (IN)	Post-Development 1	1	436.164	4.000	0.09	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 1	1	426.876	5.350	0.00	124.68	2,992.977
Pond 1 (IN)	Post-Development 2	2	2,605.631	12.150	0.51	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 2	2	2,582.949	15.400	0.04	124.88	3,967.417
Pond 1 (IN)	Post-Development 5	5	4,616.580	12.150	1.07	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 5	5	4,591.860	14.450	0.08	125.08	5,042.154
Pond 1 (IN)	Post-Development 10	10	6,106.160	12.100	1.49	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 10	10	6,079.712	14.600	0.10	125.25	5,989.070
Pond 1 (IN)	Post-Development 25	25	8,103.885	12.100	2.08	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 25	25	8,074.945	14.800	0.12	125.47	7,317.894
Pond 1 (IN)	Post-Development 50	50	9,650.664	12.100	2.54	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 50	50	9,619.856	15.000	0.13	125.64	8,382.155

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (m^3)	Time to Peak (hours)	Peak Flow (m^3/s)	Maximum Water Surface Elevation (m)	Maximum Pond Storage (m^3)
Pond 1 (IN)	Post-Development 100	100	11,226.469	12.100	3.00	(N/A)	(N/A)
Pond 1 (OUT)	Post-Development 100	100	11,193.734	15.150	0.15	125.81	9,488.267
Infiltration Basin1 (IN)	Post-Development 1	1	429.482	5.350	0.00	(N/A)	(N/A)
Infiltration Basin1 (OUT)	Post-Development 1	1	0.000	0.000	0.00	123.00	50.829
Infiltration Basin1 (IN)	Post-Development 2	2	2,727.988	15.100	0.05	(N/A)	(N/A)
Infiltration Basin1 (OUT)	Post-Development 2	2	0.000	0.000	0.00	123.03	524.711
Infiltration Basin1 (IN)	Post-Development 5	5	4,920.732	12.000	0.13	(N/A)	(N/A)
Infiltration Basin1 (OUT)	Post-Development 5	5	0.000	0.000	0.00	123.06	1,164.700
Infiltration Basin1 (IN)	Post-Development 10	10	6,558.493	12.000	0.20	(N/A)	(N/A)
Infiltration Basin1 (OUT)	Post-Development 10	10	0.000	0.000	0.00	123.11	2,040.455
Infiltration Basin1 (IN)	Post-Development 25	25	8,766.726	12.000	0.30	(N/A)	(N/A)
Infiltration Basin1 (OUT)	Post-Development 25	25	0.000	0.000	0.00	123.18	3,370.441
Infiltration Basin1 (IN)	Post-Development 50	50	10,483.576	12.000	0.39	(N/A)	(N/A)
Infiltration Basin1 (OUT)	Post-Development 50	50	0.000	0.000	0.00	123.24	4,483.774
Infiltration Basin1 (IN)	Post-Development 100	100	12,237.550	11.950	0.48	(N/A)	(N/A)
Infiltration Basin1 (OUT)	Post-Development 100	100	0.000	0.000	0.00	123.31	5,669.231
Pond 2 (IN)	Post-Development 1	1	1,295.666	4.000	0.25	(N/A)	(N/A)

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (m^3)	Time to Peak (hours)	Peak Flow (m^3/s)	Maximum Water Surface Elevation (m)	Maximum Pond Storage (m^3)
Pond 2 (OUT)	Post-Development 1	1	1,228.215	5.200	0.02	123.55	5,377.426
Pond 2 (IN)	Post-Development 2	2	7,023.711	12.150	1.50	(N/A)	(N/A)
Pond 2 (OUT)	Post-Development 2	2	6,905.374	15.700	0.10	123.87	8,045.212
Pond 2 (IN)	Post-Development 5	5	12,176.754	12.150	2.94	(N/A)	(N/A)
Pond 2 (OUT)	Post-Development 5	5	12,042.702	15.950	0.15	124.25	11,447.227
Pond 2 (IN)	Post-Development 10	10	15,954.419	12.100	4.01	(N/A)	(N/A)
Pond 2 (OUT)	Post-Development 10	10	15,809.295	16.100	0.18	124.53	14,117.647
Pond 2 (IN)	Post-Development 25	25	20,987.852	12.100	5.46	(N/A)	(N/A)
Pond 2 (OUT)	Post-Development 25	25	20,828.485	16.400	0.22	124.88	17,809.569
Pond 2 (IN)	Post-Development 50	50	24,866.495	12.100	6.58	(N/A)	(N/A)
Pond 2 (OUT)	Post-Development 50	50	24,696.226	16.700	0.24	125.15	20,734.756
Pond 2 (IN)	Post-Development 100	100	28,805.057	12.100	7.71	(N/A)	(N/A)
Pond 2 (OUT)	Post-Development 100	100	28,623.886	16.800	0.26	125.40	23,742.911
Infiltration Basin 2 (IN)	Post-Development 1	1	1,231.415	5.200	0.02	(N/A)	(N/A)
Infiltration Basin 2 (OUT)	Post-Development 1	1	0.000	0.000	0.00	122.01	156.337
Infiltration Basin 2 (IN)	Post-Development 2	2	7,083.969	15.300	0.11	(N/A)	(N/A)
Infiltration Basin 2 (OUT)	Post-Development 2	2	0.000	0.000	0.00	122.05	1,347.599

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (m^3)	Time to Peak (hours)	Peak Flow (m^3/s)	Maximum Water Surface Elevation (m)	Maximum Pond Storage (m^3)
Infiltration Basin 2 (IN)	Post-Development 5	5	12,447.661	12.000	0.16	(N/A)	(N/A)
Infiltration Basin 2 (OUT)	Post-Development 5	5	0.000	0.000	0.00	122.16	3,996.583
Infiltration Basin 2 (IN)	Post-Development 10	10	16,398.852	12.000	0.26	(N/A)	(N/A)
Infiltration Basin 2 (OUT)	Post-Development 10	10	0.000	0.000	0.00	122.25	6,381.230
Infiltration Basin 2 (IN)	Post-Development 25	25	21,680.284	12.000	0.41	(N/A)	(N/A)
Infiltration Basin 2 (OUT)	Post-Development 25	25	0.000	0.000	0.00	122.38	9,827.333
Infiltration Basin 2 (IN)	Post-Development 50	50	25,759.750	12.000	0.52	(N/A)	(N/A)
Infiltration Basin 2 (OUT)	Post-Development 50	50	0.000	0.000	0.00	122.48	12,611.927
Infiltration Basin 2 (IN)	Post-Development 100	100	29,909.159	11.950	0.63	(N/A)	(N/A)
Infiltration Basin 2 (OUT)	Post-Development 100	100	0.000	0.000	0.00	122.59	15,530.431

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.248 hours
Area (User Defined)	5.750 ha

Computational Time Increment	0.033 hours
Time to Peak (Computed)	12.032 hours
Flow (Peak, Computed)	1.12 m³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	1.11 m³/s

Drainage Area	
SCS CN (Composite)	80.900
Area (User Defined)	5.750 ha
Maximum Retention (Pervious)	60.0 mm
Maximum Retention (Pervious, 20 percent)	12.0 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	57.9 mm
Runoff Volume (Pervious)	3,329.496 m³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,329.778 m³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.248 hours
Computational Time Increment	0.033 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.84 m³/s
Unit peak time, Tp	0.165 hours
Unit receding limb, Tr	0.661 hours
Total unit time, Tb	0.826 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	110.00 m
Slope	0.050 m/m
Tc Multiplier	2.000
Average Velocity	0.40 m/s
Segment Time of Concentration	0.077 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	70.00 m
Slope	0.250 m/m
Tc Multiplier	2.000
Average Velocity	0.67 m/s
Segment Time of Concentration	0.029 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	290.00 m
Slope	0.006 m/m
Tc Multiplier	0.750
Average Velocity	0.57 m/s
Segment Time of Concentration	0.142 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.248 hours

Modified Puls Results Summary	
Length (Channel)	430.00 m
Travel Time (Channel)	0.091 hours
Number of Sections	1
Length (Section)	430.00 m
Flow (Weighted)	0.39 m³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	130.11 m

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	128.91 m
Volume (Starting, per section)	0.000 m³
Flow (Out Starting)	0.00 m³/s
Infiltration (Starting, per section)	0.00 m³/s
Flow (Total Out Starting)	0.00 m³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	1.11 m³/s	Time to Peak (In)	12.050 hours
Flow (Peak Out)	1.05 m³/s	Time to Peak (Out)	12.100 hours

Mass Balance (m³)	
Volume (Initial)	0.000 m³
Volume (Total Inflow)	3,329.776 m³
Volume (Total Infiltration)	0.000 m³
Volume (Total Outlet Outflow)	3,329.776 m³
Volume (Retained)	0.000 m³
Volume (Unrouted)	0.000 m³
Error (Mass Balance)	0.0 %

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.250 hours
Area (User Defined)	7.590 ha

Computational Time Increment	0.033 hours
Time to Peak (Computed)	12.058 hours
Flow (Peak, Computed)	1.48 m³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	1.48 m³/s

Drainage Area	
SCS CN (Composite)	81.200
Area (User Defined)	7.590 ha
Maximum Retention (Pervious)	58.8 mm
Maximum Retention (Pervious, 20 percent)	11.8 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	58.5 mm
Runoff Volume (Pervious)	4,443.191 m³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	4,443.225 m³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.250 hours
Computational Time Increment	0.033 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.41 m³/s
Unit peak time, Tp	0.167 hours
Unit receding limb, Tr	0.666 hours
Total unit time, Tb	0.833 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	140.00 m
Slope	0.050 m/m
Tc Multiplier	2.000
Average Velocity	0.42 m/s
Segment Time of Concentration	0.092 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	80.00 m
Slope	0.250 m/m
Tc Multiplier	2.000
Average Velocity	0.69 m/s
Segment Time of Concentration	0.032 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	220.00 m
Slope	0.004 m/m
Tc Multiplier	0.750
Average Velocity	0.49 m/s
Segment Time of Concentration	0.125 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.250 hours

Modified Puls Results Summary	
Length (Channel)	400.00 m
Travel Time (Channel)	0.142 hours
Number of Sections	1
Length (Section)	400.00 m
Flow (Weighted)	0.87 m³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	128.16 m

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	126.96 m
Volume (Starting, per section)	0.000 m³
Flow (Out Starting)	0.00 m³/s
Infiltration (Starting, per section)	0.00 m³/s
Flow (Total Out Starting)	0.00 m³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	2.49 m³/s	Time to Peak (In)	12.050 hours
Flow (Peak Out)	2.19 m³/s	Time to Peak (Out)	12.150 hours

Mass Balance (m³)	
Volume (Initial)	0.000 m³
Volume (Total Inflow)	7,773.002 m³
Volume (Total Infiltration)	0.000 m³
Volume (Total Outlet Outflow)	7,773.002 m³
Volume (Retained)	0.000 m³
Volume (Unrouted)	0.000 m³
Error (Mass Balance)	0.0 %

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.324 hours
Area (User Defined)	6.300 ha

Computational Time Increment	0.043 hours
Time to Peak (Computed)	12.094 hours
Flow (Peak, Computed)	1.14 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	1.13 m^3/s

Drainage Area	
SCS CN (Composite)	82.100
Area (User Defined)	6.300 ha
Maximum Retention (Pervious)	55.4 mm
Maximum Retention (Pervious, 20 percent)	11.1 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	60.5 mm
Runoff Volume (Pervious)	3,809.572 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,811.363 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.324 hours
Computational Time Increment	0.043 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.54 m^3/s
Unit peak time, Tp	0.216 hours
Unit receding limb, Tr	0.864 hours
Total unit time, Tb	1.080 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	105.00 m
Slope	0.050 m/m
Tc Multiplier	2.000
Average Velocity	0.39 m/s
Segment Time of Concentration	0.074 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	70.00 m
Slope	0.250 m/m
Tc Multiplier	2.000
Average Velocity	0.67 m/s
Segment Time of Concentration	0.029 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	460.00 m
Slope	0.004 m/m
Tc Multiplier	0.750
Average Velocity	0.58 m/s
Segment Time of Concentration	0.221 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.324 hours

Modified Puls Results Summary	
Length (Channel)	215.00 m
Travel Time (Channel)	0.099 hours
Number of Sections	1
Length (Section)	215.00 m
Flow (Weighted)	0.41 m³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	129.88 m

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	128.68 m
Volume (Starting, per section)	0.000 m³
Flow (Out Starting)	0.00 m³/s
Infiltration (Starting, per section)	0.00 m³/s
Flow (Total Out Starting)	0.00 m³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	1.13 m³/s	Time to Peak (In)	12.100 hours
Flow (Peak Out)	1.07 m³/s	Time to Peak (Out)	12.150 hours

Mass Balance (m³)	
Volume (Initial)	0.000 m³
Volume (Total Inflow)	3,811.376 m³
Volume (Total Infiltration)	0.000 m³
Volume (Total Outlet Outflow)	3,811.376 m³
Volume (Retained)	0.000 m³
Volume (Unrouted)	0.000 m³
Error (Mass Balance)	0.0 %

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.320 hours
Area (User Defined)	7.740 ha

Computational Time Increment	0.043 hours
Time to Peak (Computed)	12.073 hours
Flow (Peak, Computed)	1.35 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.100 hours
Flow (Peak Interpolated Output)	1.33 m^3/s

Drainage Area	
SCS CN (Composite)	81.100
Area (User Defined)	7.740 ha
Maximum Retention (Pervious)	59.2 mm
Maximum Retention (Pervious, 20 percent)	11.8 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	58.3 mm
Runoff Volume (Pervious)	4,514.567 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	4,512.912 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.320 hours
Computational Time Increment	0.043 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.92 m^3/s
Unit peak time, Tp	0.213 hours
Unit receding limb, Tr	0.853 hours
Total unit time, Tb	1.066 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	150.00 m
Slope	0.050 m/m
Tc Multiplier	2.000
Average Velocity	0.43 m/s
Segment Time of Concentration	0.097 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	80.00 m
Slope	0.250 m/m
Tc Multiplier	2.000
Average Velocity	0.69 m/s
Segment Time of Concentration	0.032 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	400.00 m
Slope	0.005 m/m
Tc Multiplier	0.750
Average Velocity	0.58 m/s
Segment Time of Concentration	0.190 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.320 hours

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.286 hours
Area (User Defined)	10.270 ha

Computational Time Increment	0.038 hours
Time to Peak (Computed)	12.071 hours
Flow (Peak, Computed)	1.93 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	1.91 m^3/s

Drainage Area	
SCS CN (Composite)	81.600
Area (User Defined)	10.270 ha
Maximum Retention (Pervious)	57.3 mm
Maximum Retention (Pervious, 20 percent)	11.5 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	59.4 mm
Runoff Volume (Pervious)	6,099.708 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	6,099.392 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.286 hours
Computational Time Increment	0.038 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.85 m^3/s
Unit peak time, Tp	0.190 hours
Unit receding limb, Tr	0.762 hours
Total unit time, Tb	0.952 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	100.00 m
Slope	0.050 m/m
Tc Multiplier	2.000
Average Velocity	0.39 m/s
Segment Time of Concentration	0.071 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	160.00 m
Slope	0.015 m/m
Tc Multiplier	0.750
Average Velocity	0.73 m/s
Segment Time of Concentration	0.061 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	290.00 m
Slope	0.080 m/m
Tc Multiplier	0.750
Average Velocity	1.59 m/s
Segment Time of Concentration	0.051 hours

Segment #4: Kirpich (TN)	
Hydraulic Length	170.00 m
Slope	0.004 m/m
Tc Multiplier	0.750
Average Velocity	0.46 m/s
Segment Time of Concentration	0.103 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.286 hours

Modified Puls Results Summary	
Length (Channel)	490.00 m
Travel Time (Channel)	0.154 hours
Number of Sections	1
Length (Section)	490.00 m
Flow (Weighted)	1.04 m³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	128.94 m

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	127.74 m
Volume (Starting, per section)	0.000 m³
Flow (Out Starting)	0.00 m³/s
Infiltration (Starting, per section)	0.00 m³/s
Flow (Total Out Starting)	0.00 m³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	2.91 m³/s	Time to Peak (In)	12.100 hours
Flow (Peak Out)	2.57 m³/s	Time to Peak (Out)	12.150 hours

Mass Balance (m³)	
Volume (Initial)	0.000 m³
Volume (Total Inflow)	9,910.780 m³
Volume (Total Infiltration)	0.000 m³
Volume (Total Outlet Outflow)	9,910.780 m³
Volume (Retained)	0.000 m³
Volume (Unrouted)	0.000 m³
Error (Mass Balance)	0.0 %

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.255 hours
Area (User Defined)	6.250 ha

Computational Time Increment	0.034 hours
Time to Peak (Computed)	12.051 hours
Flow (Peak, Computed)	1.22 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	1.22 m^3/s

Drainage Area	
SCS CN (Composite)	81.400
Area (User Defined)	6.250 ha
Maximum Retention (Pervious)	58.0 mm
Maximum Retention (Pervious, 20 percent)	11.6 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	59.0 mm
Runoff Volume (Pervious)	3,685.372 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,686.004 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.255 hours
Computational Time Increment	0.034 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.95 m^3/s
Unit peak time, Tp	0.170 hours
Unit receding limb, Tr	0.679 hours
Total unit time, Tb	0.849 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	150.00 m
Slope	0.050 m/m
Tc Multiplier	2.000
Average Velocity	0.43 m/s
Segment Time of Concentration	0.097 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	85.00 m
Slope	0.250 m/m
Tc Multiplier	2.000
Average Velocity	0.70 m/s
Segment Time of Concentration	0.034 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	250.00 m
Slope	0.006 m/m
Tc Multiplier	0.750
Average Velocity	0.56 m/s
Segment Time of Concentration	0.123 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.255 hours

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	1.500 ha

Computational Time Increment	0.013 hours
Time to Peak (Computed)	11.933 hours
Flow (Peak, Computed)	0.42 m³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	0.41 m³/s

Drainage Area	
SCS CN (Composite)	85.000
Area (User Defined)	1.500 ha
Maximum Retention (Pervious)	44.8 mm
Maximum Retention (Pervious, 20 percent)	9.0 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	66.9 mm
Runoff Volume (Pervious)	1,003.741 m³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,003.662 m³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.19 m³/s
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.302 hours
Area (User Defined)	2.800 ha

Computational Time Increment	0.040 hours
Time to Peak (Computed)	12.084 hours
Flow (Peak, Computed)	0.59 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	0.58 m^3/s

Drainage Area	
SCS CN (Composite)	85.700
Area (User Defined)	2.800 ha
Maximum Retention (Pervious)	42.4 mm
Maximum Retention (Pervious, 20 percent)	8.5 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	68.5 mm
Runoff Volume (Pervious)	1,918.732 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,918.721 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.302 hours
Computational Time Increment	0.040 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.73 m^3/s
Unit peak time, Tp	0.201 hours
Unit receding limb, Tr	0.806 hours
Total unit time, Tb	1.007 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	240.00 m
Slope	0.003 m/m
Tc Multiplier	0.750
Average Velocity	0.43 m/s
Segment Time of Concentration	0.155 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	250.00 m
Slope	0.005 m/m
Tc Multiplier	0.750
Average Velocity	0.53 m/s
Segment Time of Concentration	0.131 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	50.00 m
Slope	0.050 m/m
Tc Multiplier	0.750
Average Velocity	0.89 m/s
Segment Time of Concentration	0.016 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.302 hours

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	3.460 ha

Computational Time Increment	0.013 hours
Time to Peak (Computed)	11.947 hours
Flow (Peak, Computed)	0.52 m³/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	0.52 m³/s

Drainage Area	
SCS CN (Composite)	70.000
Area (User Defined)	3.460 ha
Maximum Retention (Pervious)	108.9 mm
Maximum Retention (Pervious, 20 percent)	21.8 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	37.2 mm
Runoff Volume (Pervious)	1,285.498 m³

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,285.273 m³

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.74 m³/s
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.188 hours
Area (User Defined)	2.110 ha

Computational Time Increment	0.025 hours
Time to Peak (Computed)	12.009 hours
Flow (Peak, Computed)	0.43 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	0.42 m^3/s

Drainage Area	
SCS CN (Composite)	79.600
Area (User Defined)	2.110 ha
Maximum Retention (Pervious)	65.1 mm
Maximum Retention (Pervious, 20 percent)	13.0 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	55.2 mm
Runoff Volume (Pervious)	1,164.532 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,164.530 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.188 hours
Computational Time Increment	0.025 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.89 m^3/s
Unit peak time, Tp	0.125 hours
Unit receding limb, Tr	0.500 hours
Total unit time, Tb	0.625 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	340.00 m
Slope	0.012 m/m
Tc Multiplier	0.750
Average Velocity	0.79 m/s
Segment Time of Concentration	0.119 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	100.00 m
Slope	0.004 m/m
Tc Multiplier	0.750
Average Velocity	0.40 m/s
Segment Time of Concentration	0.069 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.188 hours

Modified Puls Results Summary	
Length (Channel)	250.00 m
Travel Time (Channel)	0.134 hours
Number of Sections	1
Length (Section)	250.00 m
Flow (Weighted)	0.14 m³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	131.36 m

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	130.36 m
Volume (Starting, per section)	0.000 m³
Flow (Out Starting)	0.00 m³/s
Infiltration (Starting, per section)	0.00 m³/s
Flow (Total Out Starting)	0.00 m³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.42 m³/s	Time to Peak (In)	12.000 hours
Flow (Peak Out)	0.36 m³/s	Time to Peak (Out)	12.100 hours

Mass Balance (m³)	
Volume (Initial)	0.000 m³
Volume (Total Inflow)	1,164.534 m³
Volume (Total Infiltration)	0.000 m³
Volume (Total Outlet Outflow)	1,164.534 m³
Volume (Retained)	0.000 m³
Volume (Unrouted)	0.000 m³
Error (Mass Balance)	0.0 %

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.203 hours
Area (User Defined)	4.280 ha

Computational Time Increment	0.027 hours
Time to Peak (Computed)	12.012 hours
Flow (Peak, Computed)	0.85 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.000 hours
Flow (Peak Interpolated Output)	0.84 m^3/s

Drainage Area	
SCS CN (Composite)	79.700
Area (User Defined)	4.280 ha
Maximum Retention (Pervious)	64.7 mm
Maximum Retention (Pervious, 20 percent)	12.9 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	55.4 mm
Runoff Volume (Pervious)	2,371.010 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	2,370.120 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.203 hours
Computational Time Increment	0.027 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.67 m^3/s
Unit peak time, Tp	0.136 hours
Unit receding limb, Tr	0.542 hours
Total unit time, Tb	0.678 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	75.00 m
Slope	0.286 m/m
Tc Multiplier	2.000
Average Velocity	0.71 m/s
Segment Time of Concentration	0.029 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	25.00 m
Slope	0.020 m/m
Tc Multiplier	2.000
Average Velocity	0.20 m/s
Segment Time of Concentration	0.035 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	250.00 m
Slope	0.004 m/m
Tc Multiplier	0.750
Average Velocity	0.50 m/s
Segment Time of Concentration	0.139 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.203 hours

Modified Puls Results Summary	
Length (Channel)	250.00 m
Travel Time (Channel)	0.103 hours
Number of Sections	1
Length (Section)	250.00 m
Flow (Weighted)	0.41 m³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	130.28 m

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	129.28 m
Volume (Starting, per section)	0.000 m³
Flow (Out Starting)	0.00 m³/s
Infiltration (Starting, per section)	0.00 m³/s
Flow (Total Out Starting)	0.00 m³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	1.18 m³/s	Time to Peak (In)	12.050 hours
Flow (Peak Out)	1.09 m³/s	Time to Peak (Out)	12.100 hours

Mass Balance (m³)	
Volume (Initial)	0.000 m³
Volume (Total Inflow)	3,534.656 m³
Volume (Total Infiltration)	0.000 m³
Volume (Total Outlet Outflow)	3,534.656 m³
Volume (Retained)	0.000 m³
Volume (Unrouted)	0.000 m³
Error (Mass Balance)	0.0 %

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.234 hours
Area (User Defined)	4.670 ha

Computational Time Increment	0.031 hours
Time to Peak (Computed)	12.020 hours
Flow (Peak, Computed)	0.89 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	0.89 m^3/s

Drainage Area	
SCS CN (Composite)	79.900
Area (User Defined)	4.670 ha
Maximum Retention (Pervious)	63.9 mm
Maximum Retention (Pervious, 20 percent)	12.8 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	55.8 mm
Runoff Volume (Pervious)	2,606.385 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	2,606.481 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.234 hours
Computational Time Increment	0.031 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.59 m^3/s
Unit peak time, Tp	0.156 hours
Unit receding limb, Tr	0.623 hours
Total unit time, Tb	0.779 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	10.00 m
Slope	0.050 m/m
Tc Multiplier	2.000
Average Velocity	0.23 m/s
Segment Time of Concentration	0.012 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	140.00 m
Slope	0.285 m/m
Tc Multiplier	2.000
Average Velocity	0.82 m/s
Segment Time of Concentration	0.047 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	25.00 m
Slope	0.020 m/m
Tc Multiplier	2.000
Average Velocity	0.20 m/s
Segment Time of Concentration	0.035 hours

Segment #4: Kirpich (TN)	
Hydraulic Length	250.00 m
Slope	0.004 m/m
Tc Multiplier	0.750
Average Velocity	0.50 m/s
Segment Time of Concentration	0.139 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.234 hours

Modified Puls Results Summary	
Length (Channel)	310.00 m
Travel Time (Channel)	0.103 hours
Number of Sections	1
Length (Section)	310.00 m
Flow (Weighted)	0.68 m³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	129.21 m

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	128.21 m
Volume (Starting, per section)	0.000 m³
Flow (Out Starting)	0.00 m³/s
Infiltration (Starting, per section)	0.00 m³/s
Flow (Total Out Starting)	0.00 m³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	1.95 m³/s	Time to Peak (In)	12.050 hours
Flow (Peak Out)	1.79 m³/s	Time to Peak (Out)	12.100 hours

Mass Balance (m³)	
Volume (Initial)	0.000 m³
Volume (Total Inflow)	6,141.144 m³
Volume (Total Infiltration)	0.000 m³
Volume (Total Outlet Outflow)	6,141.144 m³
Volume (Retained)	0.000 m³
Volume (Unrouted)	0.000 m³
Error (Mass Balance)	0.0 %

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.246 hours
Area (User Defined)	6.100 ha

Computational Time Increment	0.033 hours
Time to Peak (Computed)	12.036 hours
Flow (Peak, Computed)	1.17 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	12.050 hours
Flow (Peak Interpolated Output)	1.16 m^3/s

Drainage Area	
SCS CN (Composite)	80.500
Area (User Defined)	6.100 ha
Maximum Retention (Pervious)	61.5 mm
Maximum Retention (Pervious, 20 percent)	12.3 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	57.1 mm
Runoff Volume (Pervious)	3,480.797 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	3,481.132 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.246 hours
Computational Time Increment	0.033 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	1.97 m^3/s
Unit peak time, Tp	0.164 hours
Unit receding limb, Tr	0.656 hours
Total unit time, Tb	0.820 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	13.00 m
Slope	0.050 m/m
Tc Multiplier	2.000
Average Velocity	0.24 m/s
Segment Time of Concentration	0.015 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	140.00 m
Slope	0.285 m/m
Tc Multiplier	2.000
Average Velocity	0.82 m/s
Segment Time of Concentration	0.047 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	25.00 m
Slope	0.020 m/m
Tc Multiplier	2.000
Average Velocity	0.20 m/s
Segment Time of Concentration	0.035 hours

Segment #4: Kirpich (TN)	
Hydraulic Length	255.00 m
Slope	0.004 m/m
Tc Multiplier	0.750
Average Velocity	0.50 m/s
Segment Time of Concentration	0.141 hours

Segment #5: Kirpich (TN)	
Hydraulic Length	55.00 m
Slope	0.013 m/m
Tc Multiplier	0.200
Average Velocity	2.02 m/s
Segment Time of Concentration	0.008 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.246 hours

Modified Puls Results Summary	
Length (Channel)	165.00 m
Travel Time (Channel)	0.056 hours
Number of Sections	1
Length (Section)	165.00 m
Flow (Weighted)	1.01 m³/s
Overflow Channel	No Overflow Data
Elevation (Overflow)	127.40 m

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Starting Water Surface)	126.40 m
Volume (Starting, per section)	0.000 m³
Flow (Out Starting)	0.00 m³/s
Infiltration (Starting, per section)	0.00 m³/s
Flow (Total Out Starting)	0.00 m³/s
Time Increment	0.050 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	2.85 m³/s	Time to Peak (In)	12.100 hours
Flow (Peak Out)	2.78 m³/s	Time to Peak (Out)	12.100 hours

Mass Balance (m³)	
Volume (Initial)	0.000 m³
Volume (Total Inflow)	9,622.263 m³
Volume (Total Infiltration)	0.000 m³
Volume (Total Outlet Outflow)	9,622.263 m³
Volume (Retained)	0.000 m³
Volume (Unrouted)	0.000 m³
Error (Mass Balance)	0.0 %

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.106 hours
Area (User Defined)	0.640 ha

Computational Time Increment	0.014 hours
Time to Peak (Computed)	11.942 hours
Flow (Peak, Computed)	0.11 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	0.11 m^3/s

Drainage Area	
SCS CN (Composite)	72.000
Area (User Defined)	0.640 ha
Maximum Retention (Pervious)	98.8 mm
Maximum Retention (Pervious, 20 percent)	19.8 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	40.6 mm
Runoff Volume (Pervious)	260.041 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	260.005 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.106 hours
Computational Time Increment	0.014 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.48 m^3/s
Unit peak time, Tp	0.071 hours
Unit receding limb, Tr	0.283 hours
Total unit time, Tb	0.353 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	20.00 m
Slope	0.285 m/m
Tc Multiplier	2.000
Average Velocity	0.53 m/s
Segment Time of Concentration	0.011 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	165.00 m
Slope	0.005 m/m
Tc Multiplier	0.750
Average Velocity	0.48 m/s
Segment Time of Concentration	0.095 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.106 hours

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	1.030 ha

Computational Time Increment	0.013 hours
Time to Peak (Computed)	11.933 hours
Flow (Peak, Computed)	0.29 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	0.28 m^3/s

Drainage Area	
SCS CN (Composite)	85.000
Area (User Defined)	1.030 ha
Maximum Retention (Pervious)	44.8 mm
Maximum Retention (Pervious, 20 percent)	9.0 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	66.9 mm
Runoff Volume (Pervious)	689.236 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	689.175 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.82 m^3/s
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.091 hours
Area (User Defined)	0.940 ha

Computational Time Increment	0.012 hours
Time to Peak (Computed)	11.929 hours
Flow (Peak, Computed)	0.28 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	0.27 m^3/s

Drainage Area	
SCS CN (Composite)	86.200
Area (User Defined)	0.940 ha
Maximum Retention (Pervious)	40.7 mm
Maximum Retention (Pervious, 20 percent)	8.1 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	69.7 mm
Runoff Volume (Pervious)	655.080 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	655.025 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.091 hours
Computational Time Increment	0.012 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	0.82 m^3/s
Unit peak time, Tp	0.060 hours
Unit receding limb, Tr	0.242 hours
Total unit time, Tb	0.302 hours

Time of Concentration Results

Segment #1: Kirpich (TN)	
Hydraulic Length	25.00 m
Slope	0.010 m/m
Tc Multiplier	0.400
Average Velocity	0.76 m/s
Segment Time of Concentration	0.009 hours

Segment #2: Kirpich (TN)	
Hydraulic Length	170.00 m
Slope	0.010 m/m
Tc Multiplier	0.750
Average Velocity	0.63 m/s
Segment Time of Concentration	0.075 hours

Segment #3: Kirpich (TN)	
Hydraulic Length	30.00 m
Slope	0.005 m/m
Tc Multiplier	0.200
Average Velocity	1.22 m/s
Segment Time of Concentration	0.007 hours

Time of Concentration (Composite)	
Time of Concentration (Composite)	0.091 hours

Storm Event	100YR 24hr SCS II
Return Event	100 years
Duration	144.000 hours
Depth	106.6 mm
Time of Concentration (Composite)	0.100 hours
Area (User Defined)	2.810 ha

Computational Time Increment	0.013 hours
Time to Peak (Computed)	11.947 hours
Flow (Peak, Computed)	0.43 m^3/s
Output Increment	0.050 hours
Time to Flow (Peak Interpolated Output)	11.950 hours
Flow (Peak Interpolated Output)	0.42 m^3/s

Drainage Area	
SCS CN (Composite)	70.000
Area (User Defined)	2.810 ha
Maximum Retention (Pervious)	108.9 mm
Maximum Retention (Pervious, 20 percent)	21.8 mm

Cumulative Runoff	
Cumulative Runoff Depth (Pervious)	37.2 mm
Runoff Volume (Pervious)	1,044.003 m^3

Hydrograph Volume (Area under Hydrograph curve)	
Volume	1,043.816 m^3

SCS Unit Hydrograph Parameters	
Time of Concentration (Composite)	0.100 hours
Computational Time Increment	0.013 hours
Unit Hydrograph Shape Factor	483.432
K Factor	0.749
Receding/Rising, Tr/Tp	1.670
Unit peak, qp	2.23 m^3/s
Unit peak time, Tp	0.067 hours
Unit receding limb, Tr	0.267 hours
Total unit time, Tb	0.333 hours

```
                Length
      .--Top---- B ----------.
W     |                      |
i     |     .------b2------. |
d     A     b1             | C
t     |     `----Bottom----' |
h     |                      |
      `----------D-----------'
        Diagram Not to Scale
```

Pond Volume Calculation for Trapezoidal Basin	
Trapezoid Top Elevation	126.75 m
Trapezoid Top Length (A to C)	172.00 m
Trapezoid Top Width (B to D)	48.00 m
Trapezoid Bottom Elevation	124.00 m
Trapezoid Bottom Length	150.00 m
Trapezoid Bottom Width	26.00 m

Pond Volume Calculation for Trapezoidal Basin	
Trapezoid Width Offset (B to b2)	11.00 m
Trapezoid Length Offset (A to b1)	11.00 m
Trapezoid Vertical Increment	0.10 m

Elevation (m)	Planimeter (m^2)	Area (ha)	A1+A2+sqr (A1*A2) (ha)	Volume (m^3)	Volume (Total) (m^3)
124.00	0.0	0.390	0.000	0.000	0.000
124.10	0.0	0.404	1.191	397.059	397.059
124.20	0.0	0.418	1.234	411.246	808.304
124.30	0.0	0.433	1.277	425.602	1,233.907
124.40	0.0	0.447	1.320	440.072	1,673.979
124.50	0.0	0.462	1.364	454.655	2,128.606
124.60	0.0	0.477	1.408	469.380	2,597.986
124.70	0.0	0.492	1.453	484.218	3,082.204
124.80	0.0	0.507	1.498	499.198	3,581.401
124.90	0.0	0.522	1.543	514.291	4,095.720
125.00	0.0	0.537	1.589	529.525	4,625.245
125.10	0.0	0.553	1.635	544.901	5,170.146
125.20	0.0	0.568	1.681	560.390	5,730.509

Subsection: Trapezoidal Volume
Label: Pond 1

Return Event: 100 years
Storm Event: 100YR 24hr SCS II

Elevation (m)	Planimeter (m^2)	Area (ha)	A1+A2+sqr (A1*A2) (ha)	Volume (m^3)	Volume (Total) (m^3)
125.30	0.0	0.584	1.728	575.993	6,306.530
125.40	0.0	0.600	1.775	591.737	6,898.267
125.50	0.0	0.616	1.823	607.623	7,505.862
125.60	0.0	0.632	1.871	623.622	8,129.483
125.70	0.0	0.648	1.919	639.734	8,769.246
125.80	0.0	0.664	1.968	655.988	9,425.234
125.90	0.0	0.681	2.017	672.384	10,097.618
126.00	0.0	0.697	2.067	688.892	10,786.510
126.10	0.0	0.714	2.117	705.543	11,492.052
126.20	0.0	0.731	2.167	722.306	12,214.358
126.30	0.0	0.748	2.218	739.211	12,953.541
126.40	0.0	0.765	2.269	756.230	13,709.771
126.50	0.0	0.782	2.320	773.390	14,483.161
126.60	0.0	0.799	2.372	790.663	15,273.795
126.75	0.0	0.826	2.437	1,218.644	16,492.468

Structure ID: Culvert 1 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	291.0 mm
Length	20.00 m
Length (Computed Barrel)	20.00 m
Slope (Computed)	0.005 m/m

Outlet Control Data	
Manning's n	0.013
Ke	0.900
Kb	0.033
Kr	0.900
Convergence Tolerance	0.00 m

Inlet Control Data	
Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.158
T2 ratio (HW/D)	1.304
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	124.94 m	T1 Flow	0.07 m³/s
T2 Elevation	124.98 m	T2 Flow	0.08 m³/s

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	124.60 m
Volume (Initial)	2,597.986 m³
Flow (Initial Outlet)	0.00 m³/s
Flow (Initial Infiltration)	0.00 m³/s
Flow (Initial, Total)	0.00 m³/s
Time Increment	0.050 hours

Elevation (m)	Outflow (m³/s)	Storage (m³)	Area (ha)	Infiltration (m³/s)	Flow (Total) (m³/s)	2S/t + O (m³/s)
124.00	0.00	0.000	0.390	0.00	0.00	0.00
124.05	0.00	196.757	0.397	0.00	0.00	2.19
124.10	0.00	397.051	0.404	0.00	0.00	4.41
124.15	0.00	600.897	0.411	0.00	0.00	6.68
124.20	0.00	808.310	0.418	0.00	0.00	8.98
124.25	0.00	1,019.308	0.426	0.00	0.00	11.33
124.30	0.00	1,233.906	0.433	0.00	0.00	13.71
124.35	0.00	1,452.120	0.440	0.00	0.00	16.13
124.40	0.00	1,673.966	0.447	0.00	0.00	18.60
124.45	0.00	1,899.460	0.455	0.00	0.00	21.11
124.50	0.00	2,128.618	0.462	0.00	0.00	23.65
124.55	0.00	2,361.457	0.469	0.00	0.00	26.24
124.60	0.00	2,597.991	0.477	0.00	0.00	28.87
124.65	0.00	2,838.237	0.484	0.00	0.00	31.54
124.70	0.01	3,082.212	0.492	0.00	0.01	34.25
124.75	0.01	3,329.930	0.499	0.00	0.01	37.01
124.80	0.02	3,581.409	0.507	0.00	0.02	39.82
124.85	0.04	3,836.663	0.514	0.00	0.04	42.67
124.90	0.05	4,095.710	0.522	0.00	0.05	45.56
124.95	0.06	4,358.565	0.530	0.00	0.06	48.49
125.00	0.07	4,625.244	0.537	0.00	0.07	51.47
125.05	0.08	4,895.763	0.545	0.00	0.08	54.48
125.10	0.09	5,170.138	0.553	0.00	0.09	57.53
125.15	0.09	5,448.384	0.560	0.00	0.09	60.63
125.20	0.10	5,730.520	0.568	0.00	0.10	63.77
125.25	0.10	6,016.559	0.576	0.00	0.10	66.95
125.30	0.11	6,306.518	0.584	0.00	0.11	70.18
125.35	0.11	6,600.413	0.592	0.00	0.11	73.45
125.40	0.12	6,898.260	0.600	0.00	0.12	76.76
125.45	0.12	7,200.075	0.608	0.00	0.12	80.12
125.50	0.12	7,505.875	0.616	0.00	0.12	83.52
125.55	0.13	7,815.674	0.624	0.00	0.13	86.97
125.60	0.13	8,129.490	0.632	0.00	0.13	90.46
125.65	0.14	8,447.337	0.640	0.00	0.14	93.99
125.70	0.14	8,769.233	0.648	0.00	0.14	97.58
125.75	0.14	9,095.192	0.656	0.00	0.14	101.20

Elevation (m)	Outflow (m^3/s)	Storage (m^3)	Area (ha)	Infiltration (m^3/s)	Flow (Total) (m^3/s)	2S/t + O (m^3/s)
125.80	0.15	9,425.232	0.664	0.00	0.15	104.87
125.85	0.15	9,759.367	0.672	0.00	0.15	108.59
125.90	0.21	10,097.615	0.681	0.00	0.21	112.41
125.95	0.33	10,439.990	0.689	0.00	0.33	116.33
126.00	0.49	10,786.510	0.697	0.00	0.49	120.34
126.05	0.69	11,137.190	0.706	0.00	0.69	124.44
126.10	0.93	11,492.046	0.714	0.00	0.93	128.62
126.15	1.22	11,851.093	0.722	0.00	1.22	132.90
126.20	1.54	12,214.349	0.731	0.00	1.54	137.26
126.25	1.91	12,581.829	0.739	0.00	1.91	141.71
126.30	2.32	12,953.549	0.748	0.00	2.32	146.24
126.35	2.77	13,329.525	0.756	0.00	2.77	150.87
126.40	3.26	13,709.773	0.765	0.00	3.26	155.59
126.45	3.80	14,094.308	0.773	0.00	3.80	160.41
126.50	4.39	14,483.149	0.782	0.00	4.39	165.31
126.55	5.02	14,876.309	0.791	0.00	5.02	170.32
126.60	5.71	15,273.805	0.799	0.00	5.71	175.41
126.65	6.44	15,675.651	0.808	0.00	6.44	180.61
126.70	7.22	16,081.861	0.817	0.00	7.22	185.90
126.75	8.05	16,492.460	0.826	0.00	8.05	191.30

```
              Length
     .--Top---- B ----------.
W    |                      |
i    |    .------b2------.  |
d    A    b1             |  C
t    |    `----Bottom----'  |
h    |                      |
     `----------D-----------'
       Diagram Not to Scale
```

Pond Volume Calculation for Trapezoidal Basin	
Trapezoid Top Elevation	126.30 m
Trapezoid Top Length (A to C)	228.00 m
Trapezoid Top Width (B to D)	62.00 m
Trapezoid Bottom Elevation	122.80 m
Trapezoid Bottom Length	200.00 m
Trapezoid Bottom Width	32.00 m

Pond Volume Calculation for Trapezoidal Basin	
Trapezoid Width Offset (B to b2)	15.00 m
Trapezoid Length Offset (A to b1)	14.00 m
Trapezoid Vertical Increment	0.10 m

Elevation (m)	Planimeter (m^2)	Area (ha)	A1+A2+sqr (A1*A2) (ha)	Volume (m^3)	Volume (Total) (m^3)
122.80	0.0	0.640	0.000	0.000	0.000
122.90	0.0	0.660	1.950	649.872	649.872
123.00	0.0	0.680	2.009	669.693	1,319.565
123.10	0.0	0.700	2.069	689.685	2,009.250
123.20	0.0	0.720	2.129	709.790	2,719.040
123.30	0.0	0.740	2.190	730.037	3,449.077
123.40	0.0	0.761	2.251	750.425	4,199.502
123.50	0.0	0.781	2.313	770.954	4,970.484
123.60	0.0	0.802	2.375	791.626	5,762.082
123.70	0.0	0.823	2.437	812.410	6,574.520
123.80	0.0	0.844	2.500	833.365	7,407.885
123.90	0.0	0.865	2.563	854.433	8,262.318
124.00	0.0	0.886	2.627	875.642	9,137.960

Subsection: Trapezoidal Volume
Label: Pond 2

Return Event: 100 years
Storm Event: 100YR 24hr SCS II

Elevation (m)	Planimeter (m^2)	Area (ha)	A1+A2+sqr (A1*A2) (ha)	Volume (m^3)	Volume (Total) (m^3)
124.10	0.0	0.908	2.691	896.993	10,034.952
124.20	0.0	0.929	2.755	918.485	10,953.438
124.30	0.0	0.951	2.820	940.091	11,893.557
124.40	0.0	0.973	2.886	961.867	12,855.423
124.50	0.0	0.995	2.951	983.756	13,839.179
124.60	0.0	1.017	3.017	1,005.786	14,844.965
124.70	0.0	1.039	3.084	1,027.958	15,872.923
124.80	0.0	1.061	3.151	1,050.272	16,923.223
124.90	0.0	1.084	3.218	1,072.727	17,995.951
125.00	0.0	1.107	3.286	1,095.296	19,091.246
125.10	0.0	1.129	3.354	1,118.034	20,209.280
125.20	0.0	1.152	3.423	1,140.886	21,350.166
125.30	0.0	1.175	3.492	1,163.879	22,514.045
125.40	0.0	1.199	3.561	1,187.014	23,701.031
125.50	0.0	1.222	3.631	1,210.290	24,911.321
125.60	0.0	1.245	3.701	1,233.680	26,145.001
125.70	0.0	1.269	3.772	1,257.240	27,402.241
125.80	0.0	1.293	3.843	1,280.913	28,683.125
125.90	0.0	1.317	3.914	1,304.727	29,987.852
126.00	0.0	1.341	3.986	1,328.683	31,316.535
126.10	0.0	1.365	4.058	1,352.781	32,669.316
126.20	0.0	1.389	4.131	1,376.992	34,046.307
126.30	0.0	1.414	4.204	1,401.372	35,447.680

Structure ID: Culvert 2 Structure Type: Culvert-Circular	
Number of Barrels	1
Diameter	327.0 mm
Length	20.00 m
Length (Computed Barrel)	20.00 m
Slope (Computed)	0.005 m/m

Outlet Control Data	
Manning's n	0.013
Ke	0.900
Kb	0.028
Kr	0.900
Convergence Tolerance	0.00 m

Inlet Control Data	
Equation Form	Form 1
K	0.0098
M	2.0000
C	0.0398
Y	0.6700
T1 ratio (HW/D)	1.158
T2 ratio (HW/D)	1.304
Slope Correction Factor	-0.500

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...

T1 Elevation	123.78 m	T1 Flow	0.09 m³/s
T2 Elevation	123.83 m	T2 Flow	0.11 m³/s

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	123.40 m
Volume (Initial)	4,199.502 m³
Flow (Initial Outlet)	0.00 m³/s
Flow (Initial Infiltration)	0.00 m³/s
Flow (Initial, Total)	0.00 m³/s
Time Increment	0.050 hours

Elevation (m)	Outflow (m³/s)	Storage (m³)	Area (ha)	Infiltration (m³/s)	Flow (Total) (m³/s)	2S/t + O (m³/s)
122.80	0.00	0.000	0.640	0.00	0.00	0.00
122.85	0.00	322.459	0.650	0.00	0.00	3.58
122.90	0.00	649.861	0.660	0.00	0.00	7.22
122.95	0.00	982.223	0.670	0.00	0.00	10.91
123.00	0.00	1,319.562	0.680	0.00	0.00	14.66
123.05	0.00	1,661.895	0.690	0.00	0.00	18.47
123.10	0.00	2,009.240	0.700	0.00	0.00	22.32
123.15	0.00	2,361.614	0.710	0.00	0.00	26.24
123.20	0.00	2,719.033	0.720	0.00	0.00	30.21
123.25	0.00	3,081.516	0.730	0.00	0.00	34.24
123.30	0.00	3,449.078	0.740	0.00	0.00	38.32
123.35	0.00	3,821.738	0.750	0.00	0.00	42.46
123.40	0.00	4,199.512	0.761	0.00	0.00	46.66
123.45	0.00	4,582.418	0.771	0.00	0.00	50.92
123.50	0.01	4,970.472	0.781	0.00	0.01	55.23
123.55	0.02	5,363.693	0.792	0.00	0.02	59.61
123.60	0.03	5,762.095	0.802	0.00	0.03	64.05
123.65	0.04	6,165.699	0.812	0.00	0.04	68.55
123.70	0.05	6,574.519	0.823	0.00	0.05	73.10
123.75	0.07	6,988.573	0.833	0.00	0.07	77.72
123.80	0.09	7,407.880	0.844	0.00	0.09	82.40
123.85	0.10	7,832.454	0.854	0.00	0.10	87.13
123.90	0.11	8,262.315	0.865	0.00	0.11	91.91
123.95	0.12	8,697.478	0.876	0.00	0.12	96.75
124.00	0.12	9,137.962	0.886	0.00	0.12	101.65
124.05	0.13	9,583.783	0.897	0.00	0.13	106.62
124.10	0.13	10,034.958	0.908	0.00	0.13	111.63
124.15	0.14	10,491.504	0.918	0.00	0.14	116.71
124.20	0.15	10,953.440	0.929	0.00	0.15	121.85
124.25	0.15	11,420.780	0.940	0.00	0.15	127.05
124.30	0.16	11,893.544	0.951	0.00	0.16	132.31
124.35	0.16	12,371.748	0.962	0.00	0.16	137.63
124.40	0.17	12,855.409	0.973	0.00	0.17	143.01
124.45	0.17	13,344.545	0.984	0.00	0.17	148.45
124.50	0.18	13,839.172	0.995	0.00	0.18	153.95
124.55	0.18	14,339.307	1.006	0.00	0.18	159.51

Elevation (m)	Outflow (m^3/s)	Storage (m^3)	Area (ha)	Infiltration (m^3/s)	Flow (Total) (m^3/s)	2S/t + O (m^3/s)
124.60	0.19	14,844.969	1.017	0.00	0.19	165.13
124.65	0.19	15,356.173	1.028	0.00	0.19	170.82
124.70	0.20	15,872.937	1.039	0.00	0.20	176.56
124.75	0.20	16,395.278	1.050	0.00	0.20	182.37
124.80	0.21	16,923.215	1.061	0.00	0.21	188.24
124.85	0.21	17,456.761	1.073	0.00	0.21	194.18
124.90	0.22	17,995.938	1.084	0.00	0.22	200.17
124.95	0.22	18,540.759	1.095	0.00	0.22	206.23
125.00	0.22	19,091.244	1.107	0.00	0.22	212.35
125.05	0.23	19,647.408	1.118	0.00	0.23	218.53
125.10	0.23	20,209.270	1.129	0.00	0.23	224.78
125.15	0.24	20,776.846	1.141	0.00	0.24	231.09
125.20	0.24	21,350.154	1.152	0.00	0.24	237.46
125.25	0.24	21,929.210	1.164	0.00	0.24	243.90
125.30	0.25	22,514.032	1.175	0.00	0.25	250.40
125.35	0.25	23,104.636	1.187	0.00	0.25	256.97
125.40	0.26	23,701.042	1.199	0.00	0.26	263.60
125.45	0.37	24,303.263	1.210	0.00	0.37	270.41
125.50	0.59	24,911.320	1.222	0.00	0.59	277.38
125.55	0.88	25,525.227	1.234	0.00	0.88	284.50
125.60	1.24	26,145.004	1.245	0.00	1.24	291.74
125.65	1.66	26,770.666	1.257	0.00	1.66	299.11
125.70	2.14	27,402.231	1.269	0.00	2.14	306.61
125.75	2.68	28,039.716	1.281	0.00	2.68	314.23
125.80	3.27	28,683.139	1.293	0.00	3.27	321.97
125.85	3.92	29,332.515	1.305	0.00	3.92	329.84
125.90	4.63	29,987.863	1.317	0.00	4.63	337.83
125.95	5.40	30,649.199	1.329	0.00	5.40	345.94
126.00	6.22	31,316.543	1.341	0.00	6.22	354.18
126.05	7.10	31,989.907	1.353	0.00	7.10	362.55
126.10	8.04	32,669.313	1.365	0.00	8.04	371.03
126.15	9.04	33,354.775	1.377	0.00	9.04	379.65
126.20	10.10	34,046.312	1.389	0.00	10.10	388.39
126.25	11.22	34,743.940	1.401	0.00	11.22	397.26
126.30	12.40	35,447.677	1.414	0.00	12.40	406.26

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            Length
     .--Top---- B ----------.
W    |                      |
i    |    .------b2------.  |
d    A    b1             |  C
t    |    `----Bottom----'  |
h    |                      |
     `----------D-----------'
       Diagram Not to Scale
```

Pond Volume Calculation for Trapezoidal Basin	
Trapezoid Top Elevation	126.75 m
Trapezoid Top Length (A to C)	180.50 m
Trapezoid Top Width (B to D)	138.50 m
Trapezoid Bottom Elevation	123.00 m
Trapezoid Bottom Length	158.00 m
Trapezoid Bottom Width	116.00 m

Pond Volume Calculation for Trapezoidal Basin	
Trapezoid Width Offset (B to b2)	11.25 m
Trapezoid Length Offset (A to b1)	11.25 m
Trapezoid Vertical Increment	0.10 m

Elevation (m)	Planimeter (m^2)	Area (ha)	A1+A2+sqr (A1*A2) (ha)	Volume (m^3)	Volume (Total) (m^3)
123.00	0.0	1.833	0.000	0.000	0.000
123.10	0.0	1.849	5.523	1,841.020	1,841.020
123.20	0.0	1.866	5.573	1,857.557	3,698.577
123.30	0.0	1.882	5.622	1,874.122	5,572.699
123.40	0.0	1.899	5.672	1,890.772	7,463.500
123.50	0.0	1.916	5.723	1,907.508	9,371.007
123.60	0.0	1.933	5.773	1,924.300	11,295.307
123.70	0.0	1.950	5.824	1,941.176	13,236.483
123.80	0.0	1.967	5.874	1,958.138	15,194.622
123.90	0.0	1.984	5.925	1,975.157	17,169.778
124.00	0.0	2.001	5.977	1,992.232	19,162.010
124.10	0.0	2.018	6.028	2,009.392	21,171.402
124.20	0.0	2.035	6.080	2,026.637	23,198.010

Subsection: Trapezoidal Volume
Label: Infiltration Basin1

Return Event: 100 years
Storm Event: 100YR 24hr SCS II

Elevation (m)	Planimeter (m^2)	Area (ha)	A1+A2+sqr (A1*A2) (ha)	Volume (m^3)	Volume (Total) (m^3)
124.30	0.0	2.053	6.132	2,043.938	25,241.948
124.40	0.0	2.070	6.184	2,061.297	27,303.245
124.50	0.0	2.088	6.236	2,078.740	29,381.985
124.60	0.0	2.105	6.289	2,096.268	31,478.281
124.70	0.0	2.123	6.342	2,113.853	33,592.133
124.80	0.0	2.140	6.395	2,131.522	35,723.656
124.90	0.0	2.158	6.448	2,149.277	37,872.933
125.00	0.0	2.176	6.501	2,167.060	40,039.992
125.10	0.0	2.194	6.555	2,184.956	42,224.949
125.20	0.0	2.212	6.609	2,202.909	44,427.858
125.30	0.0	2.230	6.663	2,220.919	46,648.776
125.40	0.0	2.248	6.717	2,239.013	48,887.818
125.50	0.0	2.266	6.772	2,257.192	51,145.010
125.60	0.0	2.285	6.826	2,275.429	53,420.439
125.70	0.0	2.303	6.881	2,293.750	55,714.160
125.80	0.0	2.321	6.936	2,312.127	58,026.287
125.90	0.0	2.340	6.992	2,330.590	60,356.877
126.00	0.0	2.358	7.047	2,349.109	62,705.986
126.10	0.0	2.377	7.103	2,367.713	65,073.699
126.20	0.0	2.396	7.159	2,386.374	67,460.101
126.30	0.0	2.415	7.215	2,405.120	69,865.221
126.40	0.0	2.433	7.272	2,423.950	72,289.171
126.50	0.0	2.452	7.328	2,442.838	74,732.009
126.60	0.0	2.471	7.385	2,461.782	77,193.790
126.75	0.0	2.500	7.457	3,728.394	80,922.185

Infiltration	
Infiltration Method (Computed)	Average Infiltration Rate
Infiltration Rate (Average)	12.0000 mm/h

Initial Conditions	
Elevation (Water Surface, Initial)	123.00 m
Volume (Initial)	0.000 m³
Flow (Initial Outlet)	0.00 m³/s
Flow (Initial Infiltration)	0.00 m³/s
Flow (Initial, Total)	0.00 m³/s
Time Increment	0.050 hours

Elevation (m)	Outflow (m³/s)	Storage (m³)	Area (ha)	Infiltration (m³/s)	Flow (Total) (m³/s)	2S/t + O (m³/s)
123.00	0.00	0.000	1.833	0.00	0.00	0.00
123.05	0.00	918.456	1.841	0.06	0.06	10.27
123.10	0.00	1,841.032	1.849	0.06	0.06	20.52
123.15	0.00	2,767.735	1.858	0.06	0.06	30.81
123.20	0.00	3,698.576	1.866	0.06	0.06	41.16
123.25	0.00	4,633.562	1.874	0.06	0.06	51.55
123.30	0.00	5,572.704	1.882	0.06	0.06	61.98
123.35	0.00	6,516.009	1.891	0.06	0.06	72.46
123.40	0.00	7,463.487	1.899	0.06	0.06	82.99
123.45	0.00	8,415.148	1.908	0.06	0.06	93.57
123.50	0.00	9,370.999	1.916	0.06	0.06	104.19
123.55	0.00	10,331.051	1.924	0.06	0.06	114.85
123.60	0.00	11,295.311	1.933	0.06	0.06	125.57
123.65	0.00	12,263.790	1.941	0.06	0.06	136.33
123.70	0.00	13,236.495	1.950	0.06	0.06	147.14
123.75	0.00	14,213.436	1.958	0.07	0.07	157.99
123.80	0.00	15,194.623	1.967	0.07	0.07	168.89
123.85	0.00	16,180.063	1.975	0.07	0.07	179.84
123.90	0.00	17,169.767	1.984	0.07	0.07	190.84
123.95	0.00	18,163.742	1.992	0.07	0.07	201.89
124.00	0.00	19,161.998	2.001	0.07	0.07	212.98
124.05	0.00	20,164.545	2.009	0.07	0.07	224.12
124.10	0.00	21,171.390	2.018	0.07	0.07	235.30
124.15	0.00	22,182.544	2.027	0.07	0.07	246.54
124.20	0.00	23,198.014	2.035	0.07	0.07	257.82
124.25	0.00	24,217.811	2.044	0.07	0.07	269.15
124.30	0.00	25,241.942	2.053	0.07	0.07	280.53
124.35	0.00	26,270.417	2.061	0.07	0.07	291.96
124.40	0.01	27,303.246	2.070	0.07	0.08	303.45
124.45	0.02	28,340.436	2.079	0.07	0.09	314.98
124.50	0.03	29,381.998	2.088	0.07	0.10	326.56
124.55	0.04	30,427.939	2.096	0.07	0.11	338.20
124.60	0.06	31,478.270	2.105	0.07	0.13	349.89
124.65	0.07	32,532.998	2.114	0.07	0.14	361.62
124.70	0.09	33,592.133	2.123	0.07	0.16	373.41

Elevation (m)	Outflow (m^3/s)	Storage (m^3)	Area (ha)	Infiltration (m^3/s)	Flow (Total) (m^3/s)	2S/t + O (m^3/s)
124.75	0.11	34,655.685	2.132	0.07	0.18	385.25
124.80	0.13	35,723.661	2.140	0.07	0.20	397.13
124.85	0.15	36,796.072	2.149	0.07	0.22	409.07
124.90	0.17	37,872.925	2.158	0.07	0.24	421.05
124.95	0.17	38,954.231	2.167	0.07	0.24	433.07
125.00	0.17	40,039.997	2.176	0.07	0.24	445.13
125.05	0.17	41,130.233	2.185	0.07	0.24	457.25
125.10	0.17	42,224.949	2.194	0.07	0.25	469.41
125.15	0.18	43,324.152	2.203	0.07	0.25	481.63
125.20	0.18	44,427.853	2.212	0.07	0.25	493.89
125.25	0.18	45,536.059	2.221	0.07	0.25	506.21
125.30	0.18	46,648.781	2.230	0.07	0.26	518.58
125.35	0.18	47,766.026	2.239	0.07	0.26	530.99
125.40	0.19	48,887.804	2.248	0.07	0.26	543.46
125.45	0.19	50,014.125	2.257	0.08	0.26	555.98
125.50	0.19	51,144.996	2.266	0.08	0.27	568.54
125.55	0.19	52,280.428	2.275	0.08	0.27	581.16
125.60	0.19	53,420.428	2.285	0.08	0.27	593.83
125.65	0.20	54,565.007	2.294	0.08	0.27	606.55
125.70	0.20	55,714.172	2.303	0.08	0.28	619.32
125.75	0.20	56,867.934	2.312	0.08	0.28	632.14
125.80	0.20	58,026.300	2.321	0.08	0.28	645.02
125.85	0.21	59,189.280	2.331	0.08	0.28	657.94
125.90	0.21	60,356.884	2.340	0.08	0.29	670.92
125.95	0.21	61,529.119	2.349	0.08	0.29	683.94
126.00	0.21	62,705.996	2.358	0.08	0.29	697.02
126.05	0.21	63,887.522	2.368	0.08	0.29	710.15
126.10	0.22	65,073.708	2.377	0.08	0.30	723.34
126.15	0.22	66,264.561	2.386	0.08	0.30	736.57
126.20	0.22	67,460.091	2.396	0.08	0.30	749.86
126.25	0.22	68,660.308	2.405	0.08	0.30	763.19
126.30	0.22	69,865.219	2.415	0.08	0.30	776.58
126.35	0.23	71,074.835	2.424	0.08	0.31	790.03
126.40	0.23	72,289.163	2.433	0.08	0.31	803.52
126.45	0.23	73,508.214	2.443	0.08	0.31	817.07
126.50	0.23	74,731.995	2.452	0.08	0.31	830.67
126.55	0.23	75,960.517	2.462	0.08	0.32	844.32
126.60	0.24	77,193.787	2.471	0.08	0.32	858.03
126.65	0.24	78,431.815	2.481	0.08	0.32	871.78
126.70	0.24	79,674.611	2.490	0.08	0.32	885.60
126.75	0.24	80,922.182	2.500	0.08	0.32	899.46

```
           Length
    .--Top---- B ----------.
W   |                      |
i   |    .------b2------.  |
d   A    b1             |  C
t   |    `----Bottom----'  |
h   |                      |
    `----------D-----------'
     Diagram Not to Scale
```

Pond Volume Calculation for Trapezoidal Basin	
Trapezoid Top Elevation	124.50 m
Trapezoid Top Length (A to C)	232.00 m
Trapezoid Top Width (B to D)	133.00 m
Trapezoid Bottom Elevation	122.00 m
Trapezoid Bottom Length	217.00 m
Trapezoid Bottom Width	118.00 m

Pond Volume Calculation for Trapezoidal Basin	
Trapezoid Width Offset (B to b2)	7.50 m
Trapezoid Length Offset (A to b1)	7.50 m
Trapezoid Vertical Increment	0.10 m

Elevation (m)	Planimeter (m^2)	Area (ha)	A1+A2+sqr (A1*A2) (ha)	Volume (m^3)	Volume (Total) (m^3)
122.00	0.0	2.561	0.000	0.000	0.000
122.10	0.0	2.581	7.712	2,570.660	2,570.660
122.20	0.0	2.601	7.773	2,590.822	5,161.481
122.30	0.0	2.621	7.833	2,611.068	7,772.578
122.40	0.0	2.642	7.894	2,631.400	10,403.977
122.50	0.0	2.662	7.955	2,651.788	13,055.737
122.60	0.0	2.682	8.017	2,672.232	15,727.998
122.70	0.0	2.703	8.078	2,692.762	18,420.760
122.80	0.0	2.724	8.140	2,713.377	21,134.137
122.90	0.0	2.744	8.202	2,734.048	23,868.185
123.00	0.0	2.765	8.264	2,754.804	26,622.989
123.10	0.0	2.786	8.327	2,775.617	29,398.607
123.20	0.0	2.807	8.390	2,796.515	32,195.122

Subsection: Trapezoidal Volume
Label: Infiltration Basin 2

Return Event: 100 years
Storm Event: 100YR 24hr SCS II

Elevation (m)	Planimeter (m^2)	Area (ha)	A1+A2+sqr (A1*A2) (ha)	Volume (m^3)	Volume (Total) (m^3)
123.30	0.0	2.828	8.452	2,817.470	35,012.620
123.40	0.0	2.849	8.516	2,838.509	37,851.129
123.50	0.0	2.870	8.579	2,859.633	40,710.734
123.60	0.0	2.891	8.642	2,880.814	43,591.548
123.70	0.0	2.913	8.706	2,902.052	46,493.600
123.80	0.0	2.934	8.770	2,923.375	49,416.975
123.90	0.0	2.955	8.834	2,944.782	52,361.757
124.00	0.0	2.977	8.899	2,966.246	55,328.003
124.10	0.0	2.999	8.963	2,987.795	58,315.770
124.20	0.0	3.020	9.028	3,009.401	61,325.171
124.30	0.0	3.042	9.093	3,031.064	64,356.235
124.40	0.0	3.064	9.159	3,052.839	67,409.074
124.50	0.0	3.086	9.224	3,074.671	70,483.745

Infiltration	
Infiltration Method (Computed)	Average Infiltration Rate
Infiltration Rate (Average)	12.0000 mm/h

Initial Conditions	
Elevation (Water Surface, Initial)	122.00 m
Volume (Initial)	0.000 m³
Flow (Initial Outlet)	0.00 m³/s
Flow (Initial Infiltration)	0.00 m³/s
Flow (Initial, Total)	0.00 m³/s
Time Increment	0.050 hours

Elevation (m)	Outflow (m³/s)	Storage (m³)	Area (ha)	Infiltration (m³/s)	Flow (Total) (m³/s)	2S/t + O (m³/s)
122.00	0.00	0.000	2.561	0.00	0.00	0.00
122.05	0.00	1,282.814	2.571	0.09	0.09	14.34
122.10	0.00	2,570.661	2.581	0.09	0.09	28.65
122.15	0.00	3,863.552	2.591	0.09	0.09	43.01
122.20	0.00	5,161.495	2.601	0.09	0.09	57.44
122.25	0.00	6,464.499	2.611	0.09	0.09	71.91
122.30	0.00	7,772.572	2.621	0.09	0.09	86.45
122.35	0.00	9,085.725	2.631	0.09	0.09	101.04
122.40	0.00	10,403.966	2.642	0.09	0.09	115.69
122.45	0.00	11,727.303	2.652	0.09	0.09	130.39
122.50	0.00	13,055.747	2.662	0.09	0.09	145.15
122.55	0.00	14,389.306	2.672	0.09	0.09	159.97
122.60	0.00	15,727.989	2.682	0.09	0.09	174.84
122.65	0.00	17,071.804	2.693	0.09	0.09	189.78
122.70	0.00	18,420.762	2.703	0.09	0.09	204.77
122.75	0.00	19,774.871	2.713	0.09	0.09	219.81
122.80	0.00	21,134.139	2.724	0.09	0.09	234.91
122.85	0.00	22,498.577	2.734	0.09	0.09	250.08
122.90	0.00	23,868.193	2.744	0.09	0.09	265.29
122.95	0.00	25,242.996	2.755	0.09	0.09	280.57
123.00	0.00	26,622.994	2.765	0.09	0.09	295.90
123.05	0.00	28,008.198	2.776	0.09	0.09	311.29
123.10	0.00	29,398.616	2.786	0.09	0.09	326.74
123.15	0.00	30,794.256	2.797	0.09	0.09	342.25
123.20	0.00	32,195.129	2.807	0.09	0.09	357.82
123.25	0.00	33,601.243	2.817	0.09	0.09	373.44
123.30	0.00	35,012.607	2.828	0.09	0.09	389.12
123.35	0.00	36,429.229	2.839	0.09	0.09	404.86
123.40	0.00	37,851.120	2.849	0.09	0.09	420.66
123.45	0.00	39,278.288	2.860	0.10	0.10	436.52
123.50	0.00	40,710.742	2.870	0.10	0.10	452.44
123.55	0.00	42,148.490	2.881	0.10	0.10	468.41
123.60	0.00	43,591.543	2.891	0.10	0.10	484.45
123.65	0.08	45,039.909	2.902	0.10	0.17	500.62
123.70	0.22	46,493.596	2.913	0.10	0.32	516.92

Elevation (m)	Outflow (m^3/s)	Storage (m^3)	Area (ha)	Infiltration (m^3/s)	Flow (Total) (m^3/s)	2S/t + O (m^3/s)
123.75	0.43	47,952.615	2.923	0.10	0.52	533.33
123.80	0.68	49,416.974	2.934	0.10	0.77	549.85
123.85	0.97	50,886.682	2.945	0.10	1.07	566.48
123.90	1.32	52,361.747	2.955	0.10	1.42	583.22
123.95	1.71	53,842.180	2.966	0.10	1.81	600.06
124.00	2.15	55,327.989	2.977	0.10	2.25	617.00
124.05	2.64	56,819.183	2.988	0.10	2.74	634.06
124.10	3.17	58,315.770	2.999	0.10	3.27	651.22
124.15	3.75	59,817.761	3.009	0.10	3.85	668.50
124.20	4.39	61,325.164	3.020	0.10	4.49	685.88
124.25	5.07	62,837.988	3.031	0.10	5.17	703.37
124.30	5.80	64,356.241	3.042	0.10	5.90	720.97
124.35	6.59	65,879.934	3.053	0.10	6.69	738.69
124.40	7.42	67,409.075	3.064	0.10	7.52	756.51
124.45	8.31	68,943.673	3.075	0.10	8.41	774.46
124.50	9.26	70,483.736	3.086	0.10	9.36	792.51

Appendix C

Stormwater Management Performance Assessment

Appendix C

Stormwater Management Performance Assessment

This appendix outlines decision making criteria related to operation of the stormwater management (SWM) system. It includes performance assessment of the SWM ponds, disposal of secondary drainage layer (SDL) water and construction water into the SWM conveyance/holding system. Decision making criteria are presented in the following flow charts. The following field and laboratory sampling information shall be read in conjunction with the flow charts.

1. Sampling Locations

- Stormwater Pond Inlet
- Stormwater Pond Content
- Stormwater Pond Outlet (only if outlet valve open).
- SDL sampling port near Pumping Station PS6.
- Construction water-variable locations.

2. Water Quality Based on Field Sampling

Level 1

- conductivity < 1,000 µS/cm

Level 2

- 1,000 µS/cm < conductivity < 2,000 µS/cm

Level 3

- conductivity > 2,000 µS/cm
- 6.5 < pH < 9.0
- dissolved oxygen (DO) < 3 mg/L May through October
  <5 mg/L November to April

3. Water Quality Based on Laboratory Sample

Elevated:

- conductivity between 1,000 and 2,000 µS/cm
- TDS between 600 and 1,200 mg/L
- chloride between 150 and 250 mg/L
- sodium between 110 and 200 mg/L

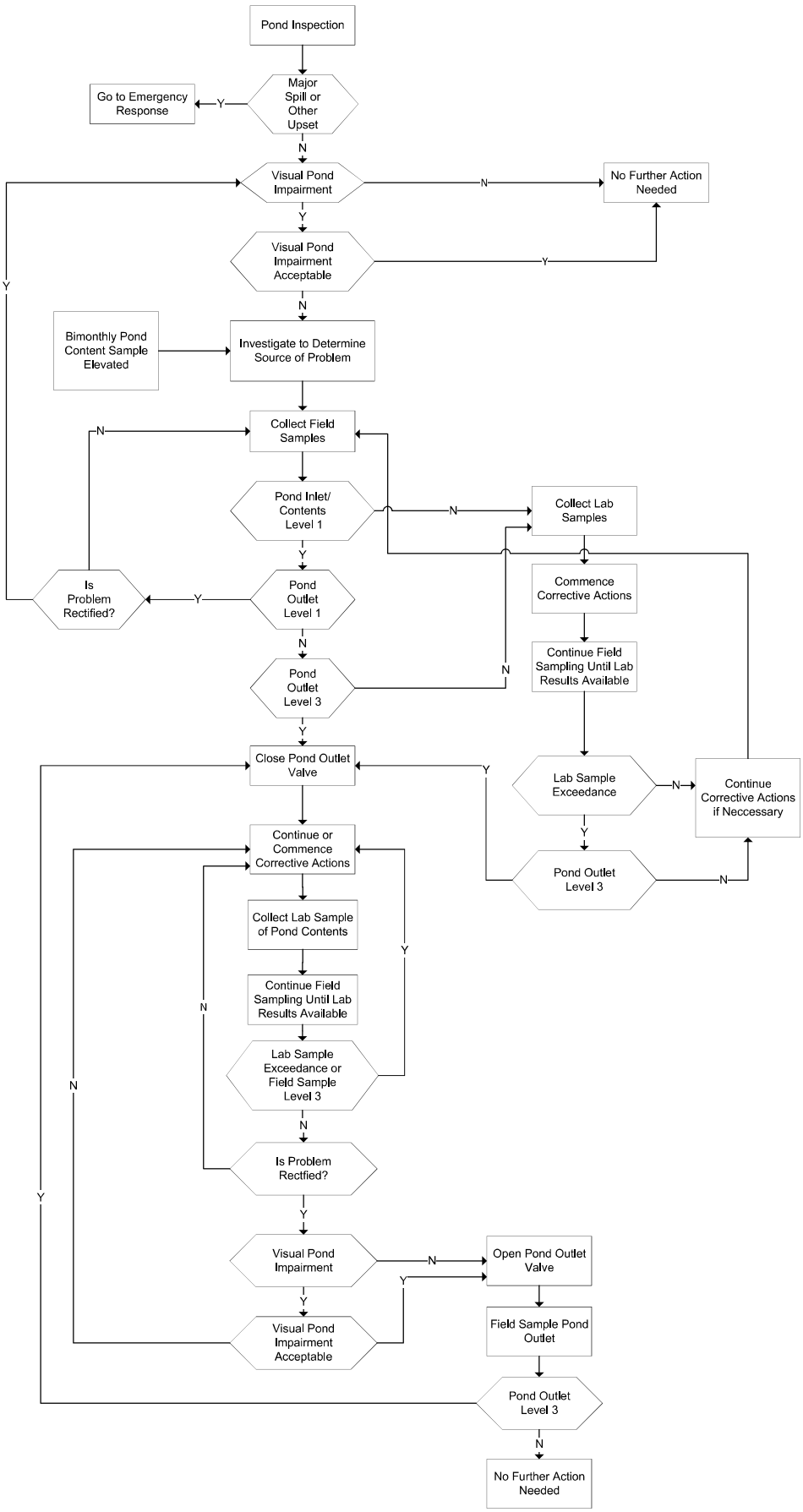
Exceedance:

- conductivity > 2,000 µS/cm
- TDS > 1,200 mg/L
- chloride > 250 mg/L
- sodium > 200 mg/L

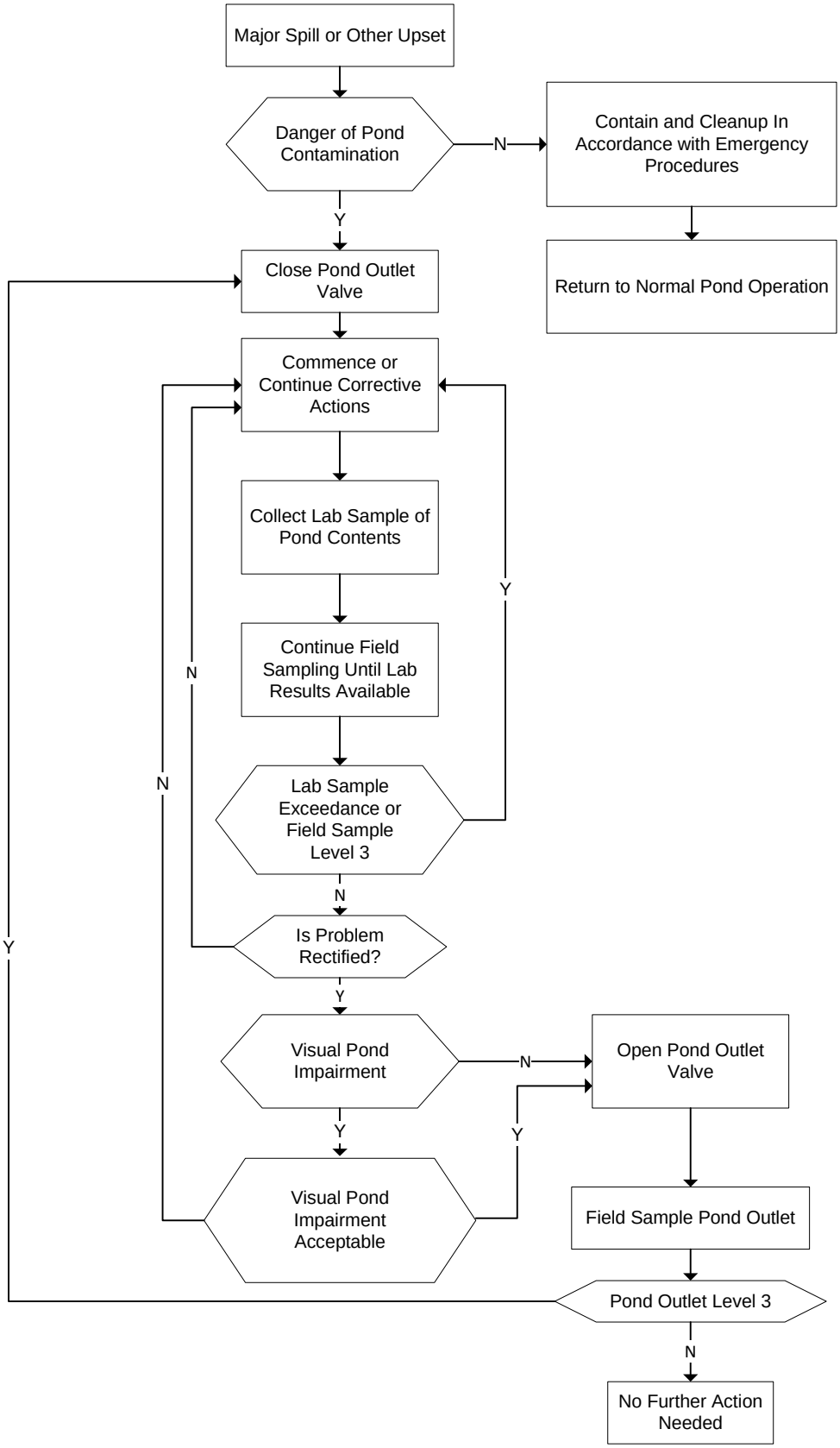
Increased turbidity shall not be considered as visual impairment of surface water. In case of a spill, indicator parameters should be revised/added based on the nature of spilled liquid.

Corrective actions will always depend on the nature of the problem. Usually it will require fixing the source of the problem such as leachate seep, exposed waste, spill, etc. If the pond contents are contaminated, corrective measures may include in-situ treatment, dilution (mixing to agitate contents, floating aerator and/or other measures to prevent stagnation), containment with booms, removal of floating material and removal of pond contents for treatment on-site or off-site.

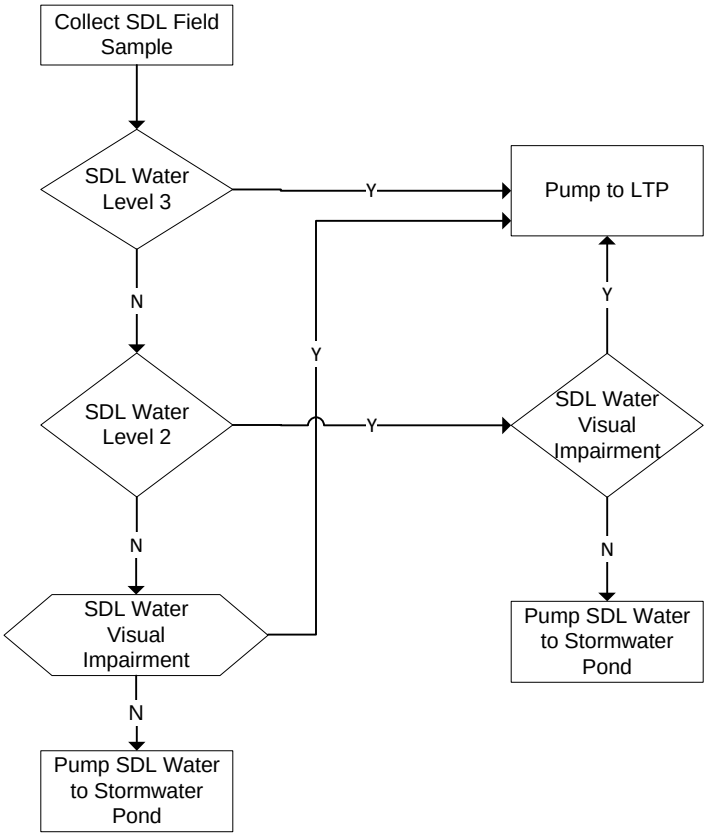
A - Regular Pond Operation



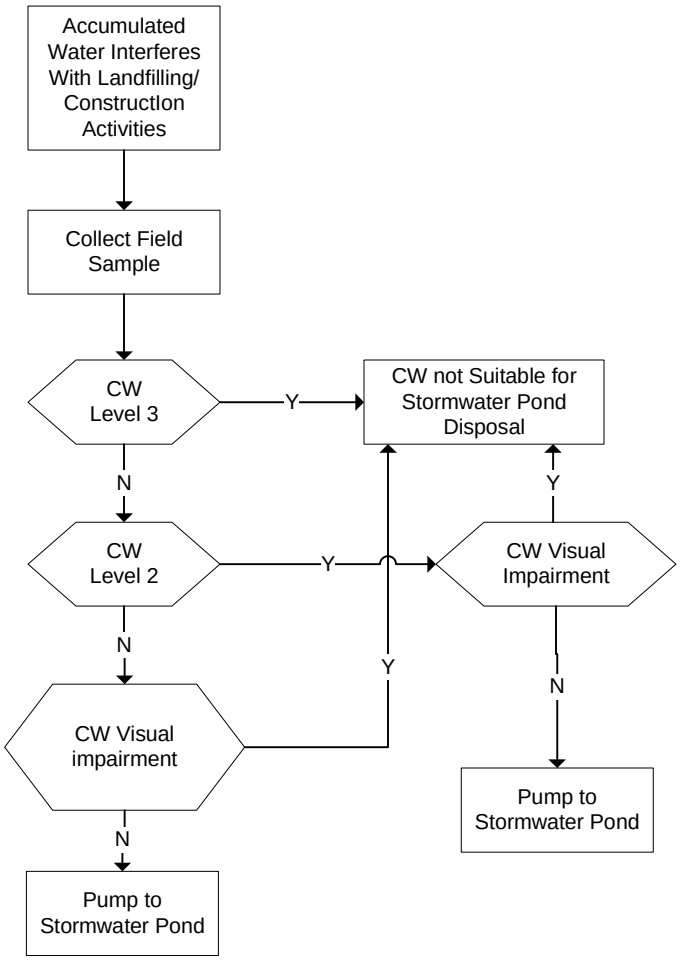
B - Stormwater Pond Emergency Response



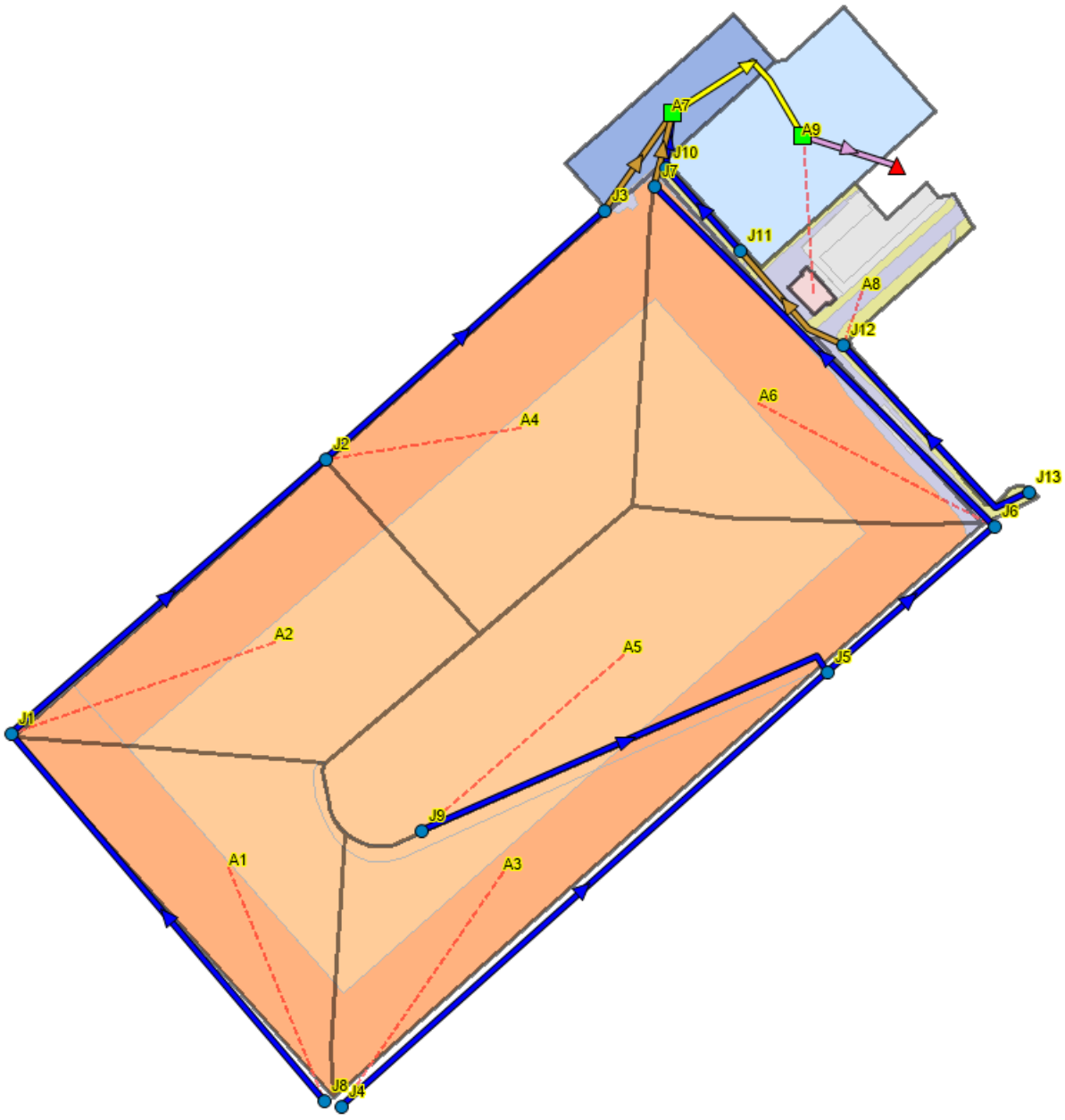
C - Handling of Secondary Drainage Layer (SDL) Water



D - Construction DewaterIng
(Handling of Construction Water (CW))



PCSWMM Output



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

****
Element Count
****
Number of rain gages 17
Number of subcatchments ... 10
Number of nodes 19
Number of links 16
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
100yr_3hr_Chicago	100yr_3hr_Chicago	INTENSITY	10 min.
100yr_3hr_Chicago_Climate_Change	100yr_3hr_Chicago_Increase_20percent	INTENSITY	10 min.
100yr_6hr_Chicago	100yr_6hr_Chicago	INTENSITY	10 min.
100yr_6hr_Chicago_Climate_Change	100yr_6hr_Chicago_Increase_20percent	INTENSITY	10 min.
100yr-24hr-SCS_Type_II	100yr-24hr-SCS_Type_II	INTENSITY	15 min.
10yr_3hr_Chicago	10yr_3hr_Chicago	INTENSITY	10 min.
10yr_6hr_Chicago	10yr_6hr_Chicago	INTENSITY	10 min.
25mm_3hr_Chicago	25mm_3hr_Chicago	INTENSITY	10 min.
25mm_4hr_Chicago	25mm_4hr_Chicago	INTENSITY	10 min.
25yr_3hr_Chicago	25yr_3hr_Chicago	INTENSITY	10 min.
25yr_6hr_Chicago	25yr_6hr_Chicago	INTENSITY	10 min.
2yr_3hr_Chicago	2yr_3hr_Chicago	INTENSITY	10 min.
2yr_6hr_Chicago	2yr_6hr_Chicago	INTENSITY	10 min.
50yr_3hr_Chicago	50yr_3hr_Chicago	INTENSITY	10 min.
50yr_6hr_Chicago	50yr_6hr_Chicago	INTENSITY	10 min.
5yr_3hr_Chicago	5yr_3hr_Chicago	INTENSITY	10 min.
5yr_6hr_Chicago	5yr_6hr_Chicago	INTENSITY	10 min.

****
Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
A1	5.77	294.14	0.00	15.0000	100yr-24hr-SCS_Type_II	J8
A2	7.43	330.04	0.00	15.0000	100yr-24hr-SCS_Type_II	J1
A3	6.11	313.17	0.00	15.0000	100yr-24hr-SCS_Type_II	J4
A4	7.95	353.19	0.00	15.0000	100yr-24hr-SCS_Type_II	J2
A5	10.33	574.07	0.00	5.0000	100yr-24hr-SCS_Type_II	J9
A6	6.43	268.04	0.00	15.0000	100yr-24hr-SCS_Type_II	J6
A7	1.51	1006.13	0.00	0.5000	100yr-24hr-SCS_Type_II	Pond#2
A8	2.69	335.96	0.00	3.5000	100yr-24hr-SCS_Type_II	J12
A8_MB	0.11	31.83	0.00	2.0000	100yr-24hr-SCS_Type_II	IB2
A9	3.53	2353.07	0.00	0.5000	100yr-24hr-SCS_Type_II	IB2

****
Node Summary
****

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow

J1	JUNCTION	128.89	3.00	0.0
J10	JUNCTION	124.70	3.00	0.0
J11	JUNCTION	125.14	3.01	0.0
J12	JUNCTION	125.60	3.00	1000.0
J13	JUNCTION	130.80	3.00	0.0
J14	JUNCTION	126.21	3.00	0.0
J15	JUNCTION	0.00	126.60	0.0
J2	JUNCTION	127.05	3.00	0.0
J3	JUNCTION	125.22	3.00	0.0
J4	JUNCTION	131.51	3.00	0.0
J5	JUNCTION	128.95	3.00	0.0
J6	JUNCTION	127.74	3.00	0.0
J7	JUNCTION	125.02	3.09	0.0
J8	JUNCTION	131.51	3.00	0.0
J9	JUNCTION	150.00	3.00	0.0
OF1	OUTFALL	0.00	0.00	0.0
OF2	OUTFALL	122.00	0.00	0.0
IB2	STORAGE	122.00	2.50	0.0
Pond#2	STORAGE	122.80	3.50	0.0

****
Link Summary
****

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	Pond#2	IB2	CONDUIT	25.0	0.4000	0.0130
C10	J9	J5	CONDUIT	465.6	4.5257	0.0350
C11	J13	J12	CONDUIT	267.5	1.9445	0.0350
C12	J12	J11	CONDUIT	146.2	0.3831	0.0120
C13	J11	J10	CONDUIT	115.3	0.3816	0.0350
C14	J10	Pond#2	CONDUIT	5.0	41.0817	0.0350
C15	J14	J15	CONDUIT	51.1	1.1930	0.0350
C2	J1	J2	CONDUIT	428.6	0.4293	0.0350
C3	J2	J3	CONDUIT	385.0	0.4753	0.0350
C4	J3	Pond#2	CONDUIT	25.0	0.8800	0.0240
C5	J4	J5	CONDUIT	671.5	0.3812	0.0350
C6	J5	J6	CONDUIT	229.6	0.5269	0.0350
C7	J6	J7	CONDUIT	495.6	0.5489	0.0350
C8	J7	Pond#2	CONDUIT	24.0	0.7917	0.0240
C9	J8	J1	CONDUIT	497.1	0.5270	0.0350
OL1	IB2	OF2	OUTLET			

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	CIRCULAR	0.33	0.08	0.08	0.33	1	0.08
C10	TRIANGULAR	1.10	1.65	0.44	3.00	1	5.83
C11	TRIANGULAR	1.10	4.95	0.53	9.00	1	12.99
C12	CIRCULAR	0.60	0.28	0.15	0.60	1	0.41
C13	TRIANGULAR	1.10	1.65	0.44	3.00	1	1.69
C14	TRIANGULAR	1.10	1.65	0.44	3.00	1	17.58
C15	TRIANGULAR	1.00	4.00	0.49	8.00	1	7.71
C2	TRAPEZOIDAL	1.10	4.73	0.59	7.60	1	6.26
C3	TRAPEZOIDAL	1.10	5.83	0.65	8.60	1	8.63
C4	ARCH	0.82	0.74	0.25	1.15	2	1.14
C5	TRAPEZOIDAL	1.10	4.18	0.56	7.10	1	5.01
C6	TRAPEZOIDAL	1.10	5.28	0.62	8.10	1	8.00
C7	TRAPEZOIDAL	1.10	5.83	0.65	8.60	1	9.27
C8	ARCH	0.82	0.74	0.25	1.15	2	1.08
C9	TRIANGULAR	1.10	1.65	0.44	3.00	1	1.99

```
****************
Analysis Options
****************
Flow Units ............... CMS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 11/10/2013 00:00:00
Ending Date .............. 11/14/2013 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Wet Time Step ............ 00:05:00
Dry Time Step ............ 00:05:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... YES
Maximum Trials ........... 20
Number of Threads ........ 2
Head Tolerance ........... 0.001500 m


**************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
**************************     ---------       -------
Total Precipitation ......         5.802       111.900
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........         2.663        51.358
Surface Runoff ...........         3.078        59.370
Final Storage ............         0.066         1.271
Continuity Error (%) .....        -0.089


**************************        Volume        Volume
Flow Routing Continuity        hectare-m      10^6 ltr
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         3.078        30.785
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         2.679        26.786
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.420         4.202
Final Stored Volume ......         0.820         8.197
Continuity Error (%) .....         0.009


***************************
Time-Step Critical Elements
***************************
None


*******************************
Highest Flow Instability Indexes
```

```
********************************
Link C4 (2)
Link OL1 (2)


********************************
Most Frequent Nonconverging Nodes
********************************
Convergence obtained at all time steps.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     0.50 sec
Average Time Step           :     1.00 sec
Maximum Time Step           :     1.00 sec
% of Time in Steady State   :     0.00
Average Iterations per Step :     2.00
% of Steps Not Converging   :     0.00
Time Step Frequencies       :
    1.000 -  0.871 sec      :   100.00 %
    0.871 -  0.758 sec      :     0.00 %
    0.758 -  0.660 sec      :     0.00 %
    0.660 -  0.574 sec      :     0.00 %
    0.574 -  0.500 sec      :     0.00 %


***************************
Subcatchment Runoff Summary
***************************
```

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Imperv Runoff mm	Perv Runoff mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff CMS	Runoff Coeff
A1	111.90	0.00	0.00	52.23	0.00	58.50	58.50	3.37	0.78	0.523
A2	111.90	0.00	0.00	52.33	0.00	58.39	58.39	4.34	0.93	0.522
A3	111.90	0.00	0.00	52.23	0.00	58.50	58.50	3.57	0.83	0.523
A4	111.90	0.00	0.00	52.33	0.00	58.39	58.39	4.64	1.00	0.522
A5	111.90	0.00	0.00	52.60	0.00	58.11	58.11	6.00	1.05	0.519
A6	111.90	0.00	0.00	52.39	0.00	58.34	58.34	3.75	0.77	0.521
A7	111.90	0.00	0.00	35.89	0.00	74.98	74.98	1.13	0.39	0.670
A8	111.90	0.00	0.00	34.93	0.00	75.86	75.86	2.04	0.56	0.678
A8_MB	111.90	0.00	0.00	5.14	0.00	102.47	102.47	0.12	0.04	0.916
A9	111.90	0.00	0.00	59.29	0.00	51.49	51.49	1.82	0.60	0.460

```
******************
Node Depth Summary
******************
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.03	0.58	129.47	0 12:07	0.57
J10	JUNCTION	0.10	0.63	125.33	0 18:25	0.63
J11	JUNCTION	0.05	0.66	125.80	0 12:09	0.66
J12	JUNCTION	0.12	0.73	126.33	0 12:08	0.73
J13	JUNCTION	0.00	0.00	130.80	0 00:00	0.00
J14	JUNCTION	0.00	0.00	126.21	0 00:00	0.00
J15	JUNCTION	0.00	0.00	0.00	0 00:00	0.00
J2	JUNCTION	0.02	0.56	127.61	0 12:08	0.56
J3	JUNCTION	0.03	0.77	125.99	0 12:16	0.77

J4	JUNCTION	0.02	0.51	132.02	0	12:04	0.51
J5	JUNCTION	0.02	0.50	129.45	0	12:11	0.50
J6	JUNCTION	0.02	0.53	128.27	0	12:12	0.52
J7	JUNCTION	0.05	0.73	125.75	0	12:22	0.73
J8	JUNCTION	0.06	0.88	132.39	0	12:03	0.87
J9	JUNCTION	0.04	0.61	150.61	0	12:01	0.61
OF1	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OF2	OUTFALL	0.00	0.00	122.00	0	00:00	0.00
IB2	STORAGE	0.35	0.59	122.59	2	01:58	0.59
Pond#2	STORAGE	1.17	2.53	125.33	0	18:25	2.53

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent	
J1	JUNCTION	0.930	1.525	0 12:01	4.34	7.72	0.029	
J10	JUNCTION	0.000	0.351	0 12:09	0	2.04	0.272	
J11	JUNCTION	0.000	0.351	0 12:08	0	2.03	-0.318	
J12	JUNCTION	0.557	0.557	0 12:00	2.04	2.04	0.236	
J13	JUNCTION	0.000	0.000	0 00:00	0	0	0.000	ltr
J14	JUNCTION	0.000	0.000	0 00:00	0	0	0.000	ltr
J15	JUNCTION	0.000	0.000	0 00:00	0	0	0.000	ltr
J2	JUNCTION	0.995	2.189	0 12:04	4.64	12.4	-0.189	
J3	JUNCTION	0.000	2.121	0 12:08	0	12.4	0.309	
J4	JUNCTION	0.832	0.832	0 12:00	3.57	3.57	-0.712	
J5	JUNCTION	0.000	1.677	0 12:04	0	9.61	0.381	
J6	JUNCTION	0.774	2.024	0 12:09	3.75	13.3	-0.325	
J7	JUNCTION	0.000	1.988	0 12:12	0	13.4	0.400	
J8	JUNCTION	0.783	0.783	0 12:00	3.37	3.37	-0.210	
J9	JUNCTION	1.048	1.048	0 12:00	6	6	-0.168	
OF1	OUTFALL	0.000	0.000	0 00:00	0	0	0.000	ltr
OF2	OUTFALL	0.000	0.089	2 01:58	0	26.8	0.000	
IB2	STORAGE	0.640	0.659	0 12:00	1.94	30.5	-0.001	
Pond#2	STORAGE	0.394	4.168	0 12:18	1.13	33	-0.043	

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS

IB2	9.024	12.8	0.0	0.0	15.483	21.9	2	01:58	0.089
Pond#2	9.359	26.4	0.0	0.0	22.884	64.5	0	18:25	0.242

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	0.00	0.000	0.000	0.000
OF2	91.77	0.084	0.089	26.786
System	45.89	0.084	0.089	26.786

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days	hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	0.242	0	18:25	2.88	3.14	1.00
C10	CONDUIT	1.029	0	12:02	2.97	0.18	0.48
C11	CONDUIT	0.000	0	00:00	0.00	0.00	0.33
C12	CONDUIT	0.351	0	12:08	1.24	0.85	1.00
C13	CONDUIT	0.351	0	12:09	1.22	0.21	0.42
C14	CONDUIT	0.351	0	12:09	0.97	0.02	0.79
C15	CONDUIT	0.000	0	00:00	0.00	0.00	0.00
C2	CONDUIT	1.396	0	12:07	0.91	0.22	0.52
C3	CONDUIT	2.121	0	12:08	1.00	0.25	0.60
C4	CONDUIT	1.939	0	12:16	1.55	0.85	0.74
C5	CONDUIT	0.722	0	12:07	0.74	0.14	0.45
C6	CONDUIT	1.476	0	12:11	0.94	0.18	0.47
C7	CONDUIT	1.988	0	12:12	1.04	0.21	0.56
C8	CONDUIT	1.803	0	12:22	1.50	0.83	0.71
C9	CONDUIT	0.694	0	12:04	0.98	0.35	0.66
OL1	DUMMY	0.089	2	01:58			

****
Flow Classification Summary
****

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.10	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.00
C10	1.00	0.11	0.00	0.00	0.68	0.22	0.00	0.00	0.00	0.00
C11	1.00	0.09	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C12	1.00	0.10	0.54	0.00	0.36	0.00	0.00	0.00	0.00	0.88
C13	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.15	0.00
C14	1.00	0.00	0.10	0.00	0.90	0.00	0.00	0.00	0.69	0.00
C15	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.11	0.13	0.00	0.76	0.00	0.00	0.00	0.71	0.00
C3	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.64	0.00
C4	1.00	0.11	0.00	0.00	0.15	0.00	0.00	0.74	0.00	0.16
C5	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.12	0.00

C6	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.88	0.00
C7	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.70	0.00
C8	1.00	0.11	0.00	0.00	0.18	0.00	0.00	0.70	0.00	0.06
C9	1.00	0.11	0.00	0.00	0.89	0.00	0.00	0.00	0.00	0.00

****
Conduit Surcharge Summary
****

	Hours Full			Hours Above Full	Hours Capacity
Conduit	Both Ends	Upstream	Dnstream	Normal Flow	Limited
C1	17.32	39.48	17.32	39.80	17.32
C12	0.20	0.20	0.62	0.01	0.01
C14	0.01	0.01	34.99	0.01	0.01

Analysis begun on: Thu Feb 5 09:59:05 2026
Analysis ended on: Thu Feb 5 09:59:10 2026
Total elapsed time: 00:00:05

Waste Management of Canada Limited
West Carleton Environmental Center
Environmental Assessment (EA)
Compliance Monitoring Report (CMR) for 2023

EA File: 02-08-02

March 1st, 2024

Submitted by:

Waste Management of Canada Corporation

Table of Contents

1.0 Introduction

The Minister of Environment and Climate Change (Minister) approved the amended West Carleton Environmental Center (WCEC) Environmental Assessment (EA) for the Waste Management of Canada Corporation (WMCC) on September 5, 2013. The Minister's Notice of Approval (Approval) to proceed with the Undertaking, issued under Section 9 of the Environmental Assessment Act (EAA), dictates the conditions of the Approval of the Undertaking that must be adhered to by WMCC.

Condition 4.1 of the Approval required WMCC to prepare and submit to the Director (Director) of the Environmental Assessment and Approvals Branch (EAAB) of the Ministry of Environment and Climate Change (MECP) an EA Compliance Monitoring Program (CMP) for the public record.

Condition 4.2 of the Approval requires WMCC to submit the CMP to the Director within one year of the date of the Approval or 60 days before commencement of construction whichever is earlier. WMCC submitted the CMP to the Director on September 5, 2014 and an updated CMP on June 30, 2015, and another update in April 2016.

Condition 4.3 indicates that the CMP shall include the monitoring of the proponent's implementation of the undertaking in accordance with the EA and the conditions in the Approval with respect to mitigation measures, public consultation, and additional studies and work required. The CMP shall also include monitoring of compliance with all commitments made in the EA and the approval process of the EA with respect to mitigation measures, public consultation, and additional studies and work required.

Condition 4.4 states that the CMP must include an implementation schedule.

Condition 4.5 notes that the Director may require the proponent to amend the CMP, and that the proponent must carry out the CMP, as may be amended by the Director.

Condition 4.6 states that the proponent shall make the CMP available to the MECP or its designate upon request in a timely manner when the MECP requests.

This document serves as the WCEC EA CMP and includes information on the following matters:

- A restatement of the conditions from the Minister's Approval of the WCEC EA;
- A restatement of WMCC's commitments from the amended WCEC EA document; and
- A framework for reporting on the EA CMP and an annual Compliance Monitoring Report (CMR). This CMR covers the compliance activities that occurred during calendar year 2022.

2.0 EA Notice of Approval Conditions

The Approval for the WCEC included a number of conditions of approval. Table 1 includes the proposed format of the EA CMR that will document WMCC's compliance with the Approval conditions. WMCC will provide the status of compliance with each condition of approval in the annual CMR.

3.0 EA Commitments and Monitoring

The amended WCEC EA document includes a chapter on Environmental Commitments and Monitoring (Chapter 8). To ensure that proposed mitigation measures set out in WCEC EA address the predicted effects for each discipline, WMCC developed monitoring strategies of each discipline to enable ongoing monitoring of potential environmental effects during facility construction, operation, and maintenance.

WMCC developed monitoring strategies for each discipline as part of the detailed impact assessments carried out in the EA to ensure that:

- Predicted net effects are not exceeded;
- Unexpected negative effects are addressed; and
- Predicted mitigation effects are realized.

Table 1 summarizes the EA commitments and monitoring for each discipline from the detailed impact assessments carried out in the EA.

4.0 Additional Environmental and Planning Approvals

As indicated in the amended WCEC EA, WMCC will obtain other approvals, including the Environmental Compliance Approval (ECA), Environmental Protection Act (EPA) Section 27 approval for waste disposal sites, Ontario Water Resources Act (OWRA) Section 53 approvals for the storm water management and leachate treatment facilities, and Planning Act for a zoning by-law amendment and site plan approval.

Table 1 summarizes the additional environmental and planning approvals, including the Environmental Compliance Approval (ECA), Environmental Protection Act (EPA) Section 27 approval for waste disposal sites, Ontario Water Resources Act (OWRA) Section 53 approvals for the storm water management and leachate treatment facilities, and Planning Act for a zoning by-law amendment and site plan approval.

5.0 EA Compliance Monitoring Program Framework

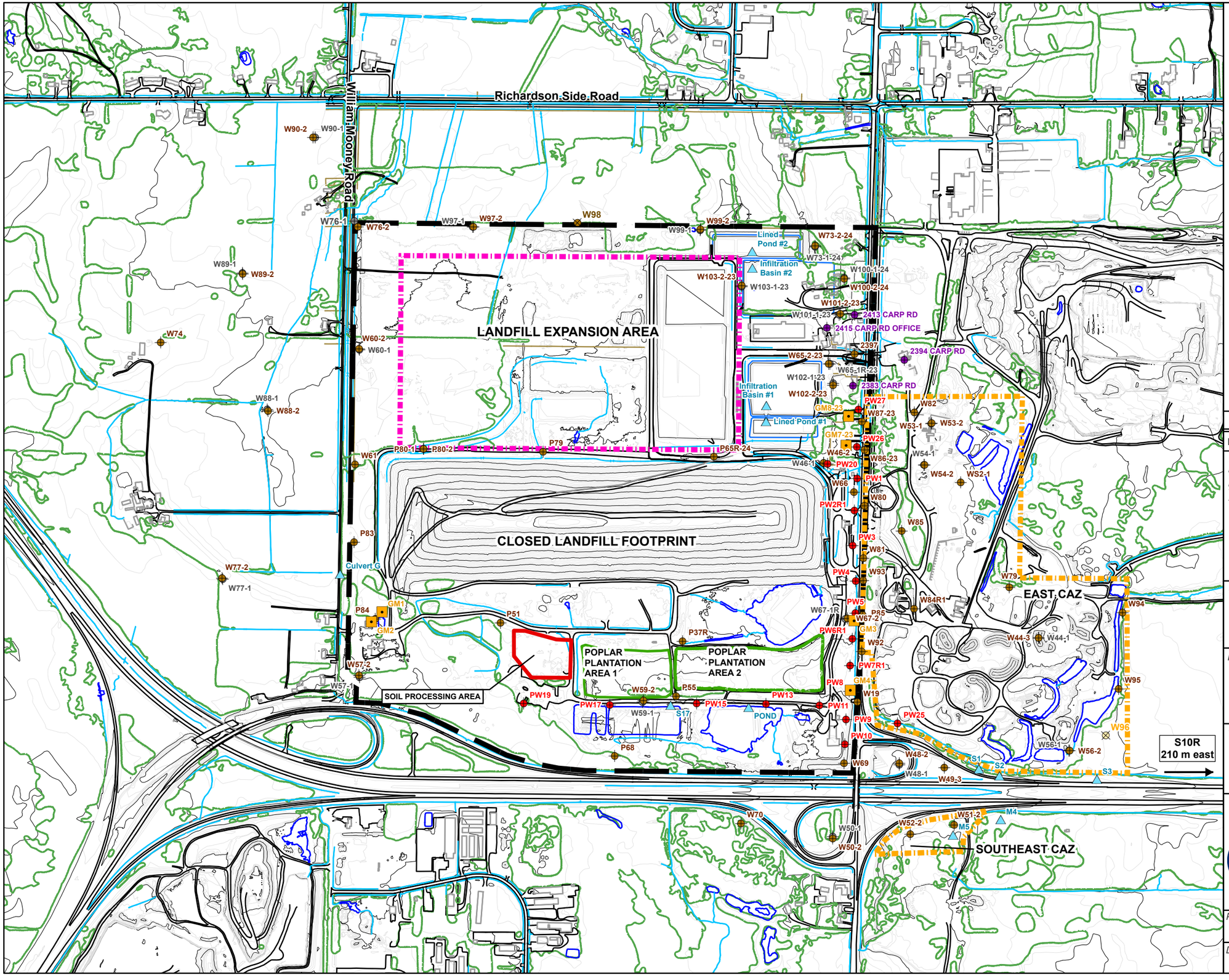
The EA CMP will consist of an annual report submitted to the Director on or before March 31 of each year. The EA CMR will document the activities conducted by WMCC over the prior calendar year (i.e., January to December). WMCC will submit an initial CMR for the WCEC in March 2014 for the calendar

year 2013. As per the EA Approval conditions, WMCC will provide the CMR to the Director of the EAAB for the public record.

6.0 Construction Update

Road construction had started to widen Carp Rd, the first phase was completed Dec 22, 2022, the remainder of the road construction was to be completed in the spring of 2023, the completion date has been extended until summer 2024 due to hold ups on the Hydro and Bell installations. The first phase of the landfill expansion project started in June 2023 this include infrastructure, storm water ponds, main access and internal road systems, cell construction. The next portion of phase 1 will start in 2024 and will be completed by 2025 this will include main cell liner construction (weather permitting), scale-house construction, paving, screening berms and landscaping.

Normal operations of our transfer station and soil pad will continue until opening of the new site.



LEGEND

- Site Boundary
- Landfill Expansion Area
- Poplar Forest
- Soil Treatment Pad
- CAZ Boundary
- Deep Bedrock Well
- Overburden - Shallow Bedrock Well
- Purge Well
- Water Supply
- Surface Water
- Gas Monitor
- Overburden - Shallow Bedrock Well (Decommissioned, To be Replaced)

Note:
All maps and data are projected in UTM Nad83 CSRS Zone 18

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS.

0 100 200 400 Meters

CLIENT

WASTE MANAGEMENT

PROJECT

West Carleton Environmental Centre – 2024 Annual Report

TITLE

Spring 2024 Site Plan and Monitoring Locations

BluMetric Environmental
1682 Woodward Drive
Ottawa, ON K2C 3R8
TEL: (613) 839-3053
FAX: (613) 839-5376
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
240129	March 07, 2025

DRAWN	CHECKED	FIG NO.	REV
GM	CM	03A	1

D:\SP\BluMetric Environmental\Geomatics - GIS\GIS_PROJECTS\PROJECTS\WM\Ottawa\PROJECTS\240129- WM - WCEC EMP 2024\APRX\2025-03-07\240129-WM-WestCarleton2024.aprx

Table 1: Summary of Landfill Monitoring Program

Waste Management of Canada Corporation - West Carleton Environmental Centre

Monitor Locations[1,2]	Parameters	Monitoring Frequency
Overburden/Shallow Bedrock		
P37R, P51, P55, P65R-24, P68, P79, P80-1, P80-2, P83, P84, W44-3, W50-2, W51-2, W52-2, W53-1, W53-2, W54-2, W56-2, W57-2, W59-2, W60-2, W61, W65-2-23, W70, W73-2-24, W74, W76-2, W77-2, W79, W82, W86-23, W87-23, W88-2, W89-2, W90-2, W94, W95, W96-24, WS2-1, PW15, PW17, PW19, PW26, PW27, W97-2, W98/W98-24, W99-2, W100-2-24, W101-2-23, W102-2-23, W103-2-23	Groundwater Elevation	Twice each year, in Spring & Fall
PW1, PW2R1, PW3, PW4, PW5, PW6R1, PW7R1, PW8, PW9, PW10, PW11, PW13, PW20, PW25, PW26, PW27, W19, W46-2, W48-2, W49-3, W65-2-23, W66, W67-2, W69, W80, W81, W82, W84R1, W85, W86-23, W92, W93, P85	Groundwater Elevation	Once each month
P65R-24, P79, P80-1, W57-2, W60-2, W61, W70, W74, W76-2, W77-2, W87-23, W88-2, W97-2, W98/W98-24, W99-2, W103-2-23	General/Inorganics	Once each year, in Spring
W44-3, W48-2, W51-2, W52-2, W53-1, W53-2, W56-2, W65-2-23, W73-2-24, W79, W82, W85, W94, W95, W96-24, WS2-1, W100-2-24, W101-2-23, W102-2-23, 2383 Carp Road[3], 2394 Carp Road (1985 well), 2397 Carp Road, 2415 Carp Road (office well), 2413 Carp Road**	General/Inorganics	Twice each year, in Spring and Fall
PW1, PW2R1, PW3, PW4, PW5, PW6R1, PW7R1, PW8*, PW9, PW10, PW20, PW26, PW27	General/Inorganics	Once each year, in Spring
W44-3, W48-2, W53-1[4], W53-2, W65-2-23, W73-2-24, W79, W82[4], W85, W87-23, WS2-1, PW1, PW2R1, PW3, PW20, PW26, PW27, W97-2, W98/W98-24, W99-2, W100-2-24, W101-2-23, W102-2-23, W103-2-23, 2383 Carp Road[3,5], 2394 Carp Road (1985 well)[5], 2397 Carp Road[5], 2415 Carp Road (office well)[5], 2413 Carp Road[5]**	VOCs	Once each year, in Spring
W44-3, W48-2, W53-1, W53-2, W65-2-23, W73-2-24, W79, W82, W85, W87-23, WS2-1, W97-2, W98/W98-24, W99-2, W100-2-24	1,4 Dioxane	Once each year, in Spring
Deep Bedrock		
W44-1, W46-1, W48-1, W50-1, W54-1, W56-1, W57-1, W59-1, W60-1, W65-1R-23, W67-1R, W73-1-24, W76-1/W76-1-24, W77-1, W88-1, W89-1, W90-1, W97-1, W99-1, W100-1-24, W101-1-23, W102-1-23, W103-1-23	Groundwater Elevation	Twice each year, in Spring & Fall
Surface Water		
S17, Pond, S1, S2, S3, Infiltration Basin #1[6], Infiltration Basin #2[6]	Surface water Elevation	Twice each year, in Spring & Fall
S1, S3, S10R, M4, M5, Culvert G	Surface Water Quality	Twice each year, in Spring & Fall
Infiltration Basin #1[6], Infiltration Basin #2[6]	Surface Water Quality, VOCs	Quarterly (March, June, September, December)
Lined Pond #1[6], Lined Pond #2[6]	Chloride, Sodium, pH, TDS, Conductivity	Once every two months
Leachate		
P3, PW8	General/Inorganics, VOCs, 1,4 Dioxane	Once each year, in Spring
P-LCS[7], S-LCS[7]	Annual Expansion Leachate General/Inorganics list, VOCs, 1,4 Dioxane	Once each year, in Spring
P-LCS[7], S-LCS[7]	Reduced Expansion Leachate General/Inorganics list	Twice per year, in summer and fall

Notes:

1 - Information regarding decommissioning, conversion, and replacement activities prior to 2024 is provided in previous annual monitoring reports.

2 - Replacement monitors from 2024 are denoted by '-24'. Monitoring and sampling in spring and fall 2024 was completed at the monitor that existed at the time of the monitoring event (i.e. at the former well or replacement well, depending on timing of the monitoring event and replacement drilling). Monitor W96 was abandoned in October 2020 and was not replaced until after the spring 2024 sampling event.

3 - Supply well 2383 Carp Road was destroyed between the spring and fall monitoring event in 2024 and will be replaced in 2025.

4 - Sample frequency increased to twice per year (spring and fall) as defined in the CAP done in addition to the EMP requirements.

5 - Sampling for VOC annually (spring) added in follow up to the CAP done in addition to the EMP requirements.

6 - Locations were not constructed for most of 2024 so monitoring began in November 2024.

7 - New landfill monitoring locations, not monitored in 2024.

* - Also designated as a leachate monitoring location (PW8 location).

** - Monitored for one year only (fall 2015 - spring 2016) to characterise background water quality .

Table 2: Water Levels - Overburden/Shallow Bedrock, Deep Bedrock and Surface Water
Waste Management of Canada Corporation - West Carleton Environmental Centre

Location	Reference Elevation*				2024 Water Levels			
	Spring 2024		Fall 2024		13-May-24		04-Nov-24	
	Type	(m asl)	Type	(m asl)	(m bref)	(m asl)	(m bref)	(m asl)
W99-2	TPVC	123.33	TPVC	123.33	1.51	121.82	2.06	121.27
W100-2-24	TOC	118.31	TOC	118.31	2.85	115.46	3.13	115.18
W101-2-23	TOC	122.25	TOC	122.25	6.74	115.51	7.06	115.20
W102-2-23	TOC	124.70	TOC	124.70	8.55	116.15	8.71	115.99
W103-2-23	TOC	127.09	TOC	127.09	8.93	118.16	9.09	118.00
WS2-1	TOC	116.62	TOC	116.62	4.80	111.82	5.10	111.53
PW1	TOC	127.40	TOC	127.40	11.23	116.16	10.69	116.71
PW2R1	TOC	128.37	TOC	128.37	11.83	116.55	11.10	117.28
PW3	TOC	128.18	TOC	128.18	13.70	114.49	13.09	115.09
PW4	TOC	128.71	TOC	128.71	12.81	115.90	12.65	116.06
PW5	TOC	128.25	TOC	128.25	11.45	116.80	11.07	117.19
PW6R1	TOC	129.84	TOC	129.84	13.15	116.68	12.76	117.08
PW7R1	TOC	133.14	TOC	133.14	15.93	117.21	15.94	117.21
PW8	TOC	131.61	TOC	131.61	14.21	117.40	14.91	116.70
PW9	TOC	127.02	TOC	127.02	9.52	117.51	10.68	116.34
PW10	TOC	127.15	TOC	127.15	8.05	119.10	10.72	116.43
PW11	TOC	125.69	TOC	125.69	5.49	120.20	6.99	118.70
PW13	TOC	124.13	TOC	124.13	1.80	122.32	2.76	121.37
PW15	TOC	124.39	TOC	124.39	1.09	123.30	1.71	122.68
PW17	TOC	127.46	TOC	127.46	2.72	124.74	3.24	124.22
PW19	TOC	128.69	TOC	128.69	3.12	125.58	4.05	124.64
PW20	TOC	131.18	TOC	131.18	17.21	113.97	17.18	114.00
PW25	TOC	118.65	TOC	118.65	1.41	117.25	2.18	116.48
PW26	TOC	127.59	TOC	127.59	11.49	116.11	11.45	116.14
PW27	TOC	124.59	TOC	124.59	8.64	115.95	8.78	115.82
Deep Bedrock Monitoring Locations								
W44-1	TOC	114.70	TOC	114.70	12.13	102.57	12.22	102.48
W46-1	TOC	131.04	TOC	131.04	13.66	117.39	13.35	117.69
W48-1	TOC	120.44	TOC	120.44	4.04	116.40	4.02	116.43
W50-1	TOC	123.49	TOC	123.49	14.69	108.81	14.18	109.32
W54-1	TOC	117.03	TOC	117.03	10.59	106.44	10.85	106.18
W56-1	TOC	115.33	TOC	115.33	21.16	94.17	21.17	94.16
W57-1	TOC	129.87	TOC	129.87	1.92	127.95	2.25	127.62
W59-1	TOC	126.94	TOC	126.94	2.05	124.89	2.79	124.15
W60-1	TOC	125.34	TOC	125.34	1.69	123.65	2.04	123.30
W65-1R-23	TOC	127.06	TOC	127.06	11.12	115.94	11.30	115.77
W67-1R	TOC	128.05	TOC	128.05	16.68	111.37	16.55	111.50
W73-1-24	TOC	119.99	TOC	119.99	20.55	99.44	13.86	106.13
W76-1/W76-1-24	TOC	124.24	TOC	124.13	1.80	122.44	2.64	121.50
W77-1	TOC	129.48	TOC	129.48	2.30	127.19	2.67	126.82
W88-1	TPVC	125.06	TPVC	125.06	0.99	124.07	1.35	123.71
W89-1	TOC	124.50	TOC	124.50	0.57	123.93	1.00	123.50
W90-1	TOC	123.07	TOC	123.07	1.71	121.36	1.75	121.32
W97-1	TOC	122.95	TOC	122.95	0.56	122.39	1.39	121.56
W99-1	TOC	123.49	TOC	123.49	1.73	121.76	2.25	121.24
W100-1-24	TOC	118.28	TOC	118.28	17.92	100.36	16.35	101.93
W101-1-23	TOC	122.51	TOC	122.51	7.08	115.43	7.38	115.13
W102-1-23	TOC	124.63	TOC	124.63	8.48	116.14	8.63	116.00
W103-1-23	TOC	127.07	TOC	127.07	24.25	102.82	23.97	103.10
Surface Water Monitoring Locations								
S17	SW (surveyed)	-	SW (surveyed)	-	-	124.07	-	124.01
S1	SW (Culvert)	115.37	SW (Culvert)	115.37	0.81	114.56	0.85	114.52
S2	SW (T-post)	114.05	SW (T-post)	114.05	0.67	113.38	0.695	113.35
S3	SW (T-post)	111.02	SW (T-post)	111.02	0.44	110.58	Dry	-
Pond	SW (surveyed)	-	SW (surveyed)	-	-	123.66	-	122.43
Infiltration Basin #1	SW (surveyed)	-	SW (surveyed)	-	-	-	Dry	-
Infiltration Basin #2	SW (surveyed)	-	SW (surveyed)	-	-	-	Dry	-

Notes:
-1 - denotes deeper interval of multilevel monitoring well location
-2 - denotes shallower interval of multilevel monitoring well location
* - reference elevations based on site surveys completed in 2024 by BluMetric
m asl - metres above sea level
m bref - metres below reference elevation
TOC - top of casing
TPVC - top of PVC riser
" - " - no value

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 2948-A9VNS2
Issue Date: June 2, 2016

Waste Management of Canada Corporation
2301 Carp Rd
Ottawa, Ontario
K0A 1L0

Site Location: West Carleton Environmental Centre
2301 Carp Rd
Lot 3 & 4, Concession 3, City of Ottawa

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:

Establishment of a stormwater management facility to service a total of 67.97 ha drainage area (19.77 ha of the northern side of the closed landfill site and 48.2 ha of the new landfill site) of the West Carleton Environmental Centre located in Lots 3 and 4, Concession 1, City of Ottawa, designed to provide quantity and quality control by attenuating peak stormwater runoff from storm events up to 1:100 year return frequency at or below pre-development levels, consisting of the following:

PROPOSED WORKS:

Stormwater management facility to service a total of 19.77 ha drainage area of the northern side of the closed landfill site consisting of the following:

Perimeter Ditch:

One (1) approximately 1,100 m long perimeter ditch running along the north side of the closed landfill site, having variable depths ranging from 1.0 m to 2.4 m with an average horizontal slope of 0.48 %, and 3H:1V side slopes discharging collected stormwater to the Stormwater Management Pond #1 (SWM Pond #1) described below;

Stormwater Management Pond #1 (SWM Pond #1)

One (1) stormwater management pond **(SWM Pond #1**) located at the southeast side of the new landfill site, lined with 600 mm thick clay liner covered with geotextile and gravel, providing a storage capacity of 2,598 m 3 at a depth of 0.6 m, equipped with one (1) 300 mm diameter outlet pipe complete with isolation valve, one (1) 3.0 m bottom width overflow spillway at elevation of 125.85 m amsl discharging to the infiltration basin #1 described below;

Infiltration Basin #1:

One (1) infiltration basin (**Infiltration Basin #1**) with an infiltration rate of 12 mm/hr, located at the southeast side of the new landfill site, having an approximate bottom length of 158 m, bottom width of 116 m, and side slopes of 3H:1V, providing a storage capacity of 25,242 m 3 at a depth of approximately 1.3 m (at elevation of 124.3 m amsl), discharging through one (1) approximately 140 m long 300 mm diameter overflow storm sewer to the infiltration basin #2 described below; and

Including all controls and associated appurtenances.

Stormwater management facility to service a total of 48.2 ha drainage area of the new landfill site consisting of the following:

Perimeter Ditches:

One (1) approximately 1,350 m long perimeter ditch running along the south side and east side of the new landfill site, having variable depths ranging from 1.0 m to 1.8 m with an average horizontal slope of 0.5 %, and 3H:1V side slopes discharging collected stormwater to the stormwater management pond #2 (**SWM Pond #2**) described below;

One (1) approximately 1,300 m long perimeter ditch running along the west side and north side of the new landfill site, having variable depths ranging from 1.0 m to 1.6 m with an average horizontal slope of 0.5 %, and 3H:1V side slopes discharging collected stormwater to the stormwater management pond #2 (**SWM Pond #2**) described below;

Stormwater Management Pond #2 (SWM Pond #2)

One (1) stormwater management pond #2 (**SWM Pond #2**) located at the northeast side of the new landfill site, lined with 600 mm thick clay liner covered with geotextile and gravel, providing a storage capacity of 4,200 m 3 at a depth of 0.6 m, equipped with one (1) 350 mm diameter outlet pipe complete with isolation valve and one (1) 6.0 m bottom width overflow spillway at elevation of 125.40 m amsl discharging to the infiltration basin #2 described below;

Infiltration Basin #2:

One (1) infiltration basin (**Infiltration Basin #2**) with an infiltration rate of 12 mm/hr, located at the northeast side of the new landfill site, having an approximate bottom length of 217 m, bottom width of 118m, and side slopes of 3H:1V, providing a storage capacity of 43,592 m 3 at a depth of approximately 1.4 m (at elevation of 123.4 m amsl); and

Including all controls and associated appurtenances.

All in accordance with the documentation listed in Schedule 'A'.

For the purpose of this environmental compliance approval, the following definitions apply:

"Approval" means this entire document and any schedules attached to it, and the application;

"CBOD5" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

"Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes

of Part II.1 of the EPA.

"District Manager" means the District Manager of the Ottawa District Office;

"EPA" means the Environmental Protection Act , R.S.O. 1990, c.E.19, as amended;

"Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

“Owner” means Waste Management of Canada Corporation and its successors and assignees;

“OWRA” means the Ontario Water Resources Act , R.S.O. 1990, c. O.40, as amended;

"Substantial Completion" has the same meaning as "substantial performance" in the Construction Lien Act ; and

“Works” means the sewage works described in the Owner’s application and this Approval and includes the Proposed Works.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

(2) Except as otherwise provided by these conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.

(3) Where there is a conflict between a provision of any submitted document referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence, and where there is a conflict between the listed submitted documents in the schedule, the document bearing the most recent date shall prevail.

(4) Where there is a conflict between the documents listed in the Schedule and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

(5) The conditions of this Approval are severable. If any condition of this Approval, or the application of any condition of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

2. EXPIRY OF APPROVAL

The approval issued by this Approval will cease to apply to those parts of the Works which have not been constructed within ten (10) years of the date of this Approval.

3. CHANGE OF OWNER

(1) The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of Owner;

(b) change of address of the Owner;

(c) change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act , R.S.O. 1990, c.B17 shall be included in the notification to the District Manager; and

(d) change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act , R.S.O. 1990, c. C39 shall be included in the notification to the District Manager.

(2) In the event of any change in Ownership of the Works, other than a change to a successor municipality, the Owner shall notify in writing the succeeding Owner of the existence of this Approval, and a copy of such notice shall be forwarded to the District Manager and the Director.

4. UPON THE SUBSTANTIAL COMPLETION OF THE WORKS

(1) Within one (1) year of the Substantial Completion of the Proposed Works, a set of as-built drawings showing the Works “as constructed” shall be prepared. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be retained at the Works or at operational office of the Owner for the operational life of the Works.

5. STORMWATER MONITORING

(1) The Owner shall collect stormwater grab samples from the following sampling point at a **quarterly frequency** (**March, June, September,** and **December NOTE***) and analysed for the following parameters listed below:

Table 1 - Stormwater Monitoring Sampling Point: Infiltration Basin #1 and Infiltration Basin #2		
Parameters	**Parameters**	**Field Parameters**
Alkalinity	Sulphate	Conductivity
Calcium	Total Ammonia Nitrogen	Dissolved Oxygen
Chemical Oxygen Demand	Total Suspended Solids	Flow Rate (Estimate)
Chloride	Total Dissolved Solids	pH
Conductivity	Total Kjeldahl Nitrogen	Temperature.
Dissolved Organic Carbon (DOC)	Un-ionized Ammonia	
Hardness	Barium	
Magnesium	Boron	
Nitrite as Nitrogen	Chromium (total, Cr6+, Cr3+)	
Nitrite as Nitrogen	Iron	
pH	Lead	
Potassium	Manganese	
Sodium	VOC	

*** Note:** Grab samples shall be collected from the Infiltration Basin #2 after a rainfall event causing a stormwater runoff flow into the pond.

(2) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;
(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions; and,
(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions.

(3) The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.

6. OPERATION AND MAINTENANCE .

(1) The Owner shall inspect the Works at least once a year and, if necessary, clean and maintain the Works to prevent the excessive buildup of sediments and/or vegetation.

(2) The Owner shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at operational office of the Owner for inspection by the Ministry. The logbook shall include the following:

(a) the name of the Works;
(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed; and
(c) the date of each spill within the catchment area, including follow-up actions / remedial measures undertaken.

7. REPORTING

(1) The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.

(2) The Owner shall prepare and submit a performance report to the District Manager on an annual basis within ninety (90) days following the end of the period being reported upon. The first such report shall cover the first annual period following the commencement of operation of the works and subsequent reports shall be submitted to cover successive annual periods following thereafter. The reports shall contain, but shall not be limited to, the following information:

(a) a summary and interpretation of all monitoring data collected under Condition 5, including an overview of the success and adequacy of the Works;
(b) a summary of any actions taken to implement the remedial and contingency action plan;
(c) a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism or thing forming part of the Works;
(d) a description of any operational issues encountered and corrective actions taken; and
(e) any other information the District Manager requires from time to time.

SCHEDULE 'A'

I. *PROPOSED WORKS:*

1. Application for Environmental Compliance Approval submitted by Waste Management of Canada Corporation dated August 20, 2014 and design specifications and engineering drawings prepared by WSP Canada Inc., Owen Sound, Ontario.

2. "Environmental Monitoring Program Reports, WCEC" dated July 2014, prepared by WESA, a division of BluMetric Environmental Inc., Ottawa, Ontario.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the Works are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the Approval and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the Owners their responsibility to notify any person they authorized to carry out work pursuant to this Approval the existence of this Approval.

2. Condition 2 is included to ensure that the Works are constructed in a timely manner so that standards applicable at the time of Approval of the Works are still applicable at the time of construction, to ensure the ongoing protection of the environment.

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to the approved works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.

4. Condition 4 is included to ensure that the Works are constructed in accordance with the approval and that record drawings of the Works “as constructed” are maintained for future references.

5. Condition 5 is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives and effluent objectives specified in the Approval and that the Works does not cause any impairment to the receiving watercourse.

6. Condition 6 is included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the owner and made available to the Ministry. Such a manual is an integral part of the operation of the Works. Its compilation and use should assist the Owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the Owner's operation of the work.

7. Condition 7 is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this Approval, so that the Ministry can work with the Owner in resolving any problems in a timely manner.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993 , S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Environmental Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca , you can determine when the leave to

appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 2nd day of June, 2016

Fariha Pannu, P.Eng.
Director
appointed for the purposes of Part II.1 of
the *Environmental Protection Act*

SH/
c: District Manager, MOECC Ottawa
Peter Brodzikowski, WSP Canada Inc.