vallee

Consulting Engineers,
Architects & Planners

December 8, 2023

Norfolk County
Community Development – Planning Department
185 Robinson Street
Simcoe, ON N3Y 5L6

Attention: **Mr. Mohammad Alam**

Reference: **Response to 2nd Submission Conditional Site Plan Approval Comments**
BB Ranch – Equestrian Resort and Tourist Accommodations
436 Front Road, South Walsingham – Norfolk County
Our Project #10-094

G. Douglas Vallee Limited has reviewed the 2nd Submission Conditional Site Plan Approval comments submitted by Norfolk County, and the Long Point Region Conservation Authority for Site Plan application SPPL2022212. Please find the following items enclosed as part of our third submission:

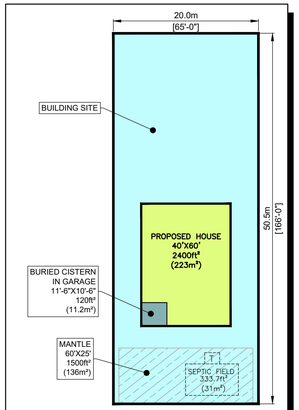
1) Site and Engineering plans, by G. Douglas Vallee Limited dated 2023-12-05
2) Schedule H Securities Cost Estimate, by G. Douglas Vallee Limited dated 2023-12-05.
3) Functional Servicing Report, by G. Douglas Vallee Limited dated 2023-12-05.
4) Stormwater Management Report, by G. Douglas Vallee Limited dated 2023-12-05.
5) Road Widening Survey Plans, by Jewitt & Dixon Limited.
6) Electrical Plans, by Integrated Engineering dated 2023-08.
7) Revised Site Concept Traffic Impact Study Letter, by Paradigm Transportation Solutions Limited dated October 5, 2023.
8) Sight Distance Review, by Paradigm Transportation Solutions Limited dated December 7, 2023.
9) Mutual Drain Agreement for Outlet B
10) Conditional Approval Comments, by Long Point Region Conservation Authority dated 2023-09-19.
11) Nutrient Management Strategy Fall 2023 – Fall 2024.
12) Geotechnical Review of Stormwater Drainage Features by Peto MacCallum Ltd. dated 2023-12-04.
13) Water Service Email Correspondence with Norfolk County date 2023-11-28.
14) Comment Response Matrix, by G. Douglas Vallee Limited dated 2023-12-08.

The attached Comment Response Matrix describes how each of the Conditional Site Plan Approval comments have been addressed.

Respectfully submitted,

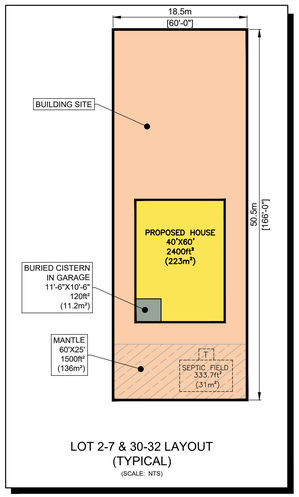
John Iezzi, P.Eng.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

H:\Projects\2010\10-094 At Play St. Williams Resort\Agency\Submissions\2023.12.05 3rd SPA Submission\10094 Submission 3 Cover Letter.docx

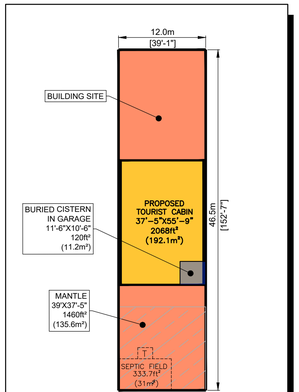


NOTE:
LOT 20 IS 83'-7"X121'-3"
LOT 21 IS 98'-5"X166'

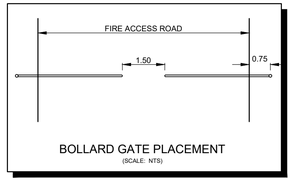
LOT 8-29 LAYOUT
(TYPICAL)
(SCALE: NTS)



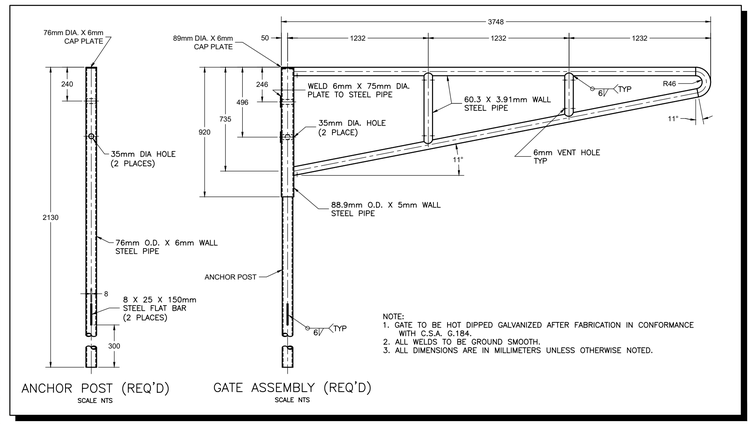
LOT 2-7 & 30-32 LAYOUT
(TYPICAL)
(SCALE: NTS)



LOT 33-40 LAYOUT
(TYPICAL)
(SCALE: NTS)



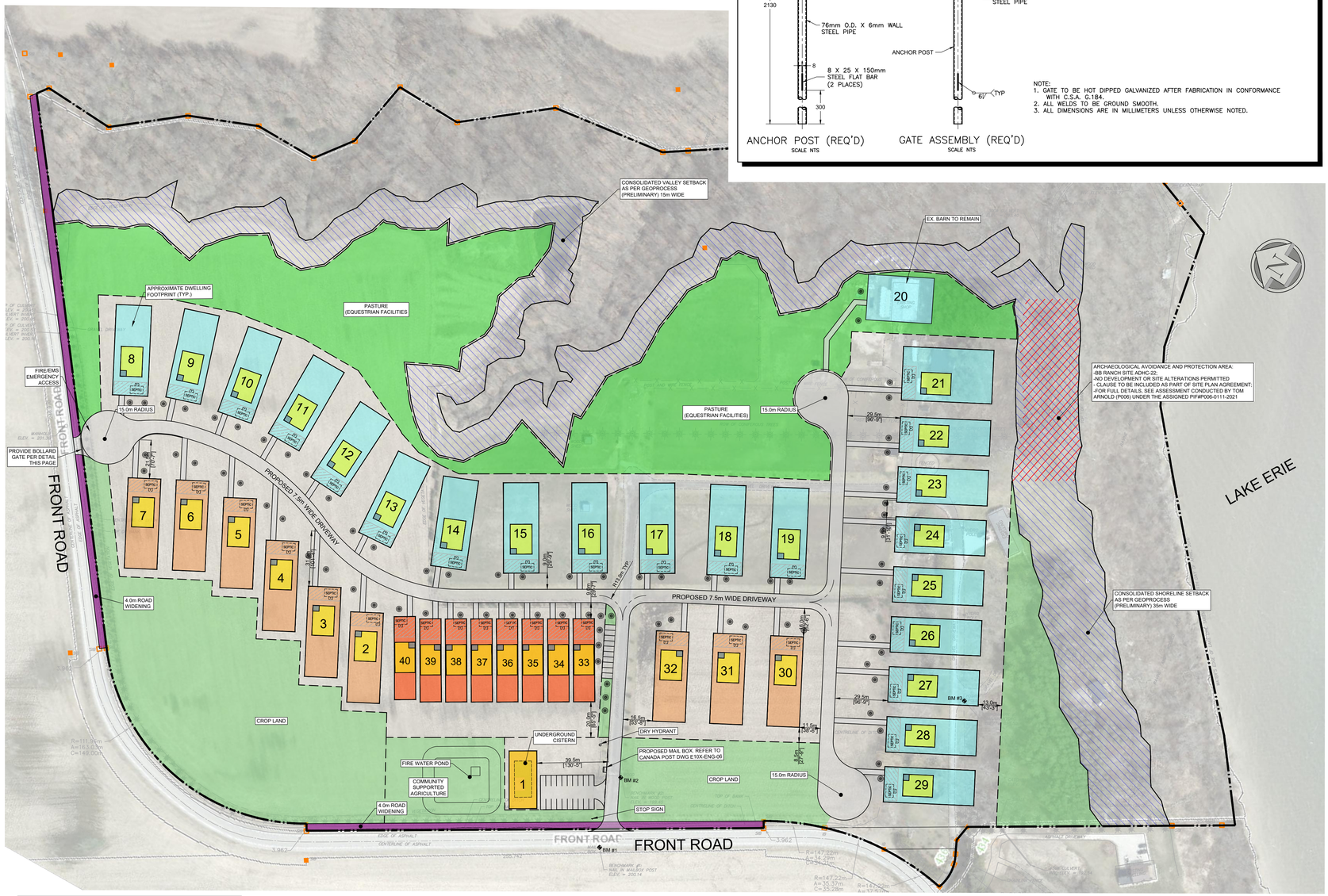
BOLLARD GATE PLACEMENT
(SCALE: NTS)



NOTE:
1. GATE TO BE HOT DIPPED GALVANIZED AFTER FABRICATION IN CONFORMANCE WITH C.S.A. G.184.
2. ALL WELDS TO BE GROUND SMOOTH.
3. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.

ANCHOR POST (REQ'D)
SCALE NTS

GATE ASSEMBLY (REQ'D)
SCALE NTS



SITE PLAN LEGEND

- PROPOSED BUILDING SITE (LOTS 2-7 & 30-32)
- PROPOSED BUILDING SITE (LOTS 8-29)
- PROPOSED TOURIST CABINS (LOTS 33-40)
- CONSTRAINT AREA AS PER GEOPROCESS PRELIMINARY MAPPING 15m AND 35m WIDE
- PASTURE AREA
- CROP LAND AREA

AGRICULTURAL (A) ZONING PROVISIONS:

MINIMUM LOT AREA:	40 HECTARES
MINIMUM LOT FRONTAGE:	30 METRES
MINIMUM FRONT YARD:	13 METRES
MINIMUM EXTERIOR SIDE YARD:	13 METRES
MINIMUM INTERIOR SIDE YARD:	3 METRES
MINIMUM REAR YARD:	9 METRES
MINIMUM SEPERATION (BETWEEN FARM PROCESSING AND DWELLING):	30 METRES
MAXIMUM BUILDING HEIGHT:	11 METRES

ON FARM LAND USE AREA TABLE

PASTURE	3.23 ha
CROP LAND	2.55 ha
COMMUNITY SUPPORTED AGRICULTURE	0.60 ha
ROAD	0.75 ha
TOTAL SITE:	23.89 ha

SPECIAL ZONING PROVISIONS 14.1002:

SINGLE DETACHED RESIDENTIAL DWELLINGS *A) MULTIPLE FARM DWELLING UNITS WITHIN A RESORT ORIENTED CONDOMINIUM*	38 UNITS
ON FARM DIVERSIFIED USE: (WITHIN A RESORT ORIENTED CONDOMINIUM) *A) A MAXIMUM OF 8-UNIT TOURIST CABINS/INN* *B) A SALOON WITH FOOD AN BEVERAGE SERVICES* *C) A WEDDING AND CONFERENCE CENTRE* *D) A RIDING ARENA/BARN WITH A MAX HEIGHT OF 20 METRES*	0 UNITS 1 UNIT 0 UNITS 1 UNIT
A RESORT- ORIENTED CONDOMINIUM DEVELOPMENT SHALL PERMIT A LOCAL ROAD	
TOTAL ON FARM DIVERSIFED USES WILL COVER A MAXIMUM OF 1 HECTARE	0.3 HA
THE GROSS FLOOR AREA OF ALL BUILDINGA USED FOR ON FARM DIVERSIFIED USE SHALL NOT EXCEED 4000 SQM	

No.	DATE	ISSUED
1	05/27/2022	FIRST SUBMISSION TO COUNTY
2	06/14/2022	REVISED TOWNHOUSE BLOCKS
3	02/16/2023	REVISED UNITS
4	03/20/2023	REVISED WITH SEPTIC
5	03/22/2023	REVISED LOT LAYOUT
6	07/06/2023	SECOND SUBMISSION TO COUNTY
7	08/03/2023	REVISED ROAD LAYOUT
8	09/07/2023	REVISED LOT WIDTHS
9	12/05/2023	THIRD SUBMISSION TO COUNTY

No.	DATE	REVISION

NOTE:
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ALL WORK, MATERIALS AND PROCESSES TO ABIDE TO MUNICIPAL STANDARDS AND SPECIFICATIONS.

TOPOGRAPHICAL INFORMATION BY KIM HUSTED SURVEYING LTD, PLAN DATED DEC 2, 2021

ELEVATIONS ARE REFERRED TO CANADIAN GEODETIC DATUM, CGVD 1928 VERTICAL DATUM

BENCHMARKS

SITE BENCHMARK #1
ELEV: 200.14m
NAIL IN MAIL BOX POST LOCATED WEST OF THE SUBJECT PROPERTY, ON THE WEST SIDE OF FRONT ROAD

SITE BENCHMARK #2
ELEV: 199.45m
NAIL IN WOOD POST LOCATED ON THE SOUTH SIDE OF THE FRONT ROAD ENTRANCE TO THE SUBJECT PROPERTY

SITE BENCHMARK #3
ELEV: 198.50m
NAIL IN HYDRO POLE LOCATED ON THE SOUTH SIDE OF THE EXISTING SECONDARY ENTRANCE TO THE SUBJECT PROPERTY.

DRAWING LIST:

PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION

SCALE 1:1250
25 50

BB RANCH

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Stamp
LICENSED PROFESSIONAL ENGINEER
2023.12.05
J. T. IEZZI
100189485
PROVINCE OF ONTARIO

Project Title
BB RANCH
VACATION RESORT
ST. WILLIAMS - NORFOLK COUNTY

Drawing Title
SITE PLAN

Designed by : N.B.N	Drawn By : N.B.N
Checked by : J.T.I.	Date Started : SEPTEMBER 2010
Drawing Scale : 1:1250	Drawing No. C100
Project No. 10-094	

DATE LAST PLOTTED : December 8, 2023

No.	DATE	ISSUED
1	05/27/2022	FIRST SUBMISSION TO COUNTY
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NAIL IN HYDRO POLE LOCATED ON THE SOUTH SIDE OF THE EXISTING SECONDARY ENTRANCE TO THE SUBJECT PROPERTY.

LEGEND

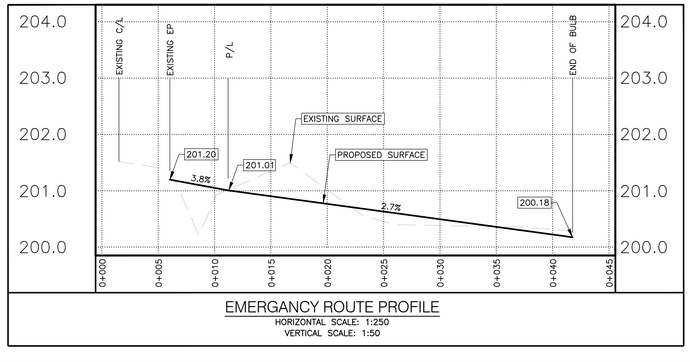
- 247.20 — PROPOSED SPOT ELEVATION
- OVERLAND FLOW DIRECTION
- EXISTING GROUND CONTOUR
- [235.45] / 30 / [235.23] — MINIMUM ELEVATION AT GARAGE SILL AT FRONT OF UNIT; UNIT NUMBER; MINIMUM TOP OF SOD ELEVATION AT REAR OF HOUSE
- (235.18) — ROAD C/L ELEVATION
- 10m—2.0% — FLOW DIRECTION WITH GRADE AND DISTANCE BETWEEN POINTS
- ROPOSED GRADE BREAK
- PROPOSED SWALE
- PROPOSED MATCH LINE
- 247.20 MATCH — MATCH TO EXISTING GROUND

SCALE 1:1000
0 25 50

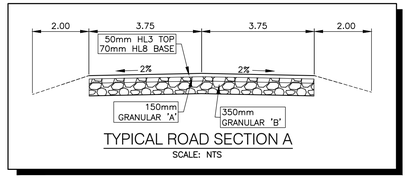
NOTES

1. PARKING AND AISLES TO ADHERE TO PAVEMENT DESIGNS CONTAINED WITHIN THE GEOTECHNICAL REPORT AND MUNICIPAL DESIGN CRITERIA
2. LOT ENTRANCES TO MATCH EXISTING GRADES OF ADJOINING ROADWAYS. LOT PERIMETER TO MATCH ADJACENT PROPERTIES
3. CONTRACTOR TO LOACTE, DISCONNECT AND REMOVE EXISTING WATER SERVICES ON SITE
4. GENERAL CONTRACTOR TO COORDINATE ALL WORK WITHIN THE SITE WITH THE MUNICIPALITY AND OBTAIN ALL NECESSARY PERMITS AND APPROVALS FROM LOCAL AUTHORITIES. EXECUTE ALL WORK AS PER MUNICIPAL REQUIREMENTS.
5. GENERAL CONTRACTOR TO EXECUTE WORK TO CONSTRUCTION SITE ACCESS UNDER SUPERVISION OF THE ENGINEER. REFER TO ENTRANCE PERMIT REQUIREMENTS WHERE APPLICABLE. DRIVEWAY ENTRANCE TO BE MODIFIED OR INSTALLATION OF NEW ENTRANCE AS PER MUNICIPAL REQUIREMENTS. PROVIDE NEW CONC. ENTRANCE CURBS TO MATCH EXISTING AS REQUIRED.
6. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION, ALL BENCHMARKS, SERVICE ELEVATIONS, DIMENSIONS AND GRADES MUST BE CHECKED BY THE CONTRACTOR AND ANY DISCREPANCIES REPORTED TO THE ENGINEER.
7. AT LEAST TWO DIFFERENT BENCHMARKS MUST BE REFERRED TO AT ALL TIMES.
8. TRAFFIC CONTROL SHALL BE IMPLEMENTED BY THE CONTRACTOR IN ACCORDANCE WITH OTM TEMPORARY CONDITIONS BOOK 7. APPROVAL FOR THE TRAFFIC CONTROL WILL BE SOUGHT FROM THE MUNICIPALITY BY THE CONTRACTOR.
9. REFER TO LOT GRADING DETAILS ON C104 FOR MORE DETAILED LOT GRADING
10. REFER TO DRY HYDRANT DETAIL ON C104

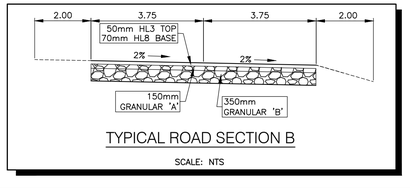
LOT SERVICING
EACH LOT WILL BE PRIVATELY SERVICED BY INDEPENDENT CISTERN AND SEPTIC SYSTEMS, TO BE DESIGNED BY OTHERS



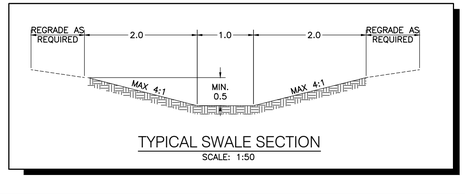
EMERGANCY ROUTE PROFILE
HORIZONTAL SCALE: 1:250
VERTICAL SCALE: 1:50



TYPICAL ROAD SECTION A
SCALE: NTS



TYPICAL ROAD SECTION B
SCALE: NTS



TYPICAL SWALE SECTION
SCALE: 1:50

PRELIMINARY DRAWING
NOT TO BE USED FOR CONSTRUCTION

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Stamp
LICENSED PROFESSIONAL ENGINEER
2023.12.05
J. T. JEZZI
100189465
PROVINCE OF ONTARIO

Project Title
BB RANCH
VACATION RESORT
ST. WILLIAMS - NORFOLK COUNTY

Drawing Title
GRADING AND SERVICING PLAN

Designed by : NBN	Drawn By : NBN
Checked by : JJI	Date Started : JANUARY 2022
Drawing Scale : 1:1000	Drawing No. C101
Project No. 10-094	

DATE LAST PLOTTED : December 8, 2023

No.	DATE	ISSUED
1	05/27/2022	FIRST SUBMISSION TO COUNTY
2	07/06/2023	SECOND SUBMISSION TO COUNTY
3	08/03/2023	REVISED ROAD LAYOUT
4	09/07/2023	REVISED LOT WIDTHS
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TOPOGRAPHICAL INFORMATION BY KIM HUSTED SURVEYING LTD, PLAN DATED DEC 2, 2021

ELEVATIONS ARE REFERRED TO CANADIAN GEODETIC DATUM, CGVD 1928 VERTICAL DATUM

BENCHMARKS

SITE BENCHMARK #1
ELEV: 200.14m
NAIL IN MAIL BOX POST LOCATED WEST OF THE SUBJECT PROPERTY, ON THE WEST SIDE OF FRONT ROAD

SITE BENCHMARK #2
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PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

SCALE 1:1000
0 25 50

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Stamp
LICENCED PROFESSIONAL ENGINEER
2023.12.08
J. T. IEZZI
100189485
PROVINCE OF ONTARIO

Project Title
BB RANCH
VACATION RESORT
ST. WILLIAMS - NORFOLK COUNTY

Drawing Title
EROSION AND SEDIMENT CONTROL PLAN

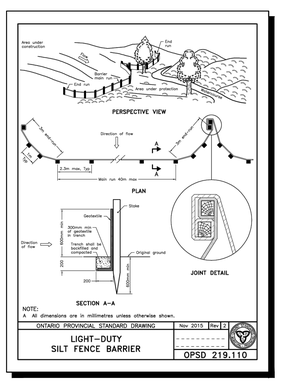
Designed by : NBN	Drawn By : NBN
Checked by : JTI	Date Started : MAY 2022
Drawing Scale : 1:1000	Drawing No. C102
Project No. 10-094	

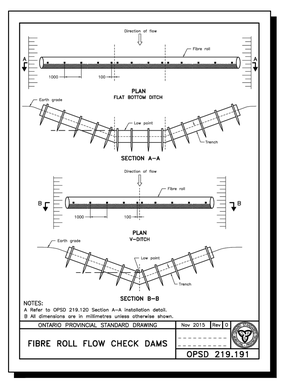
DATE LAST PLOTTED : December 8, 2023

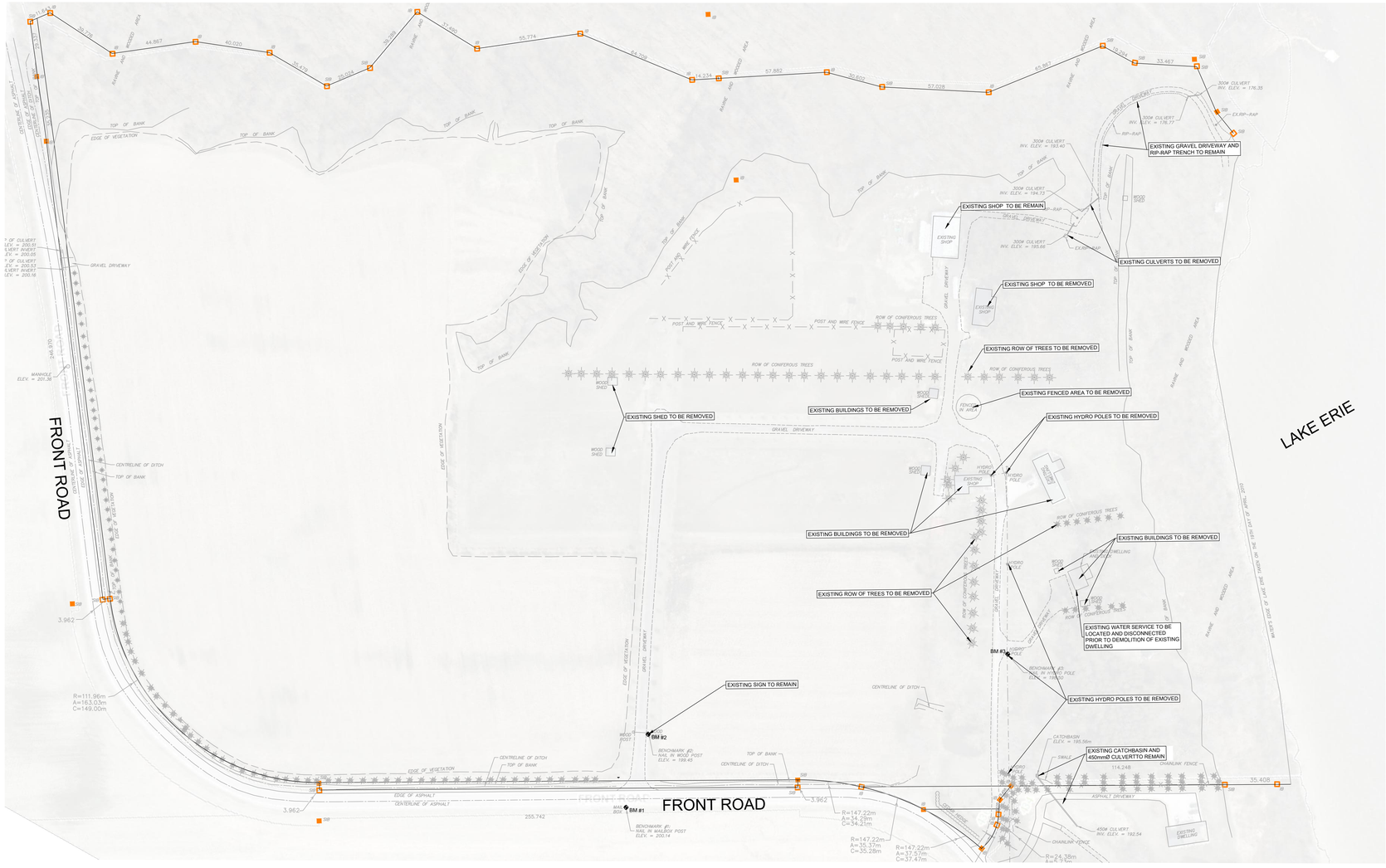
EROSION CONTROL NOTES

1. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR DESIGN AND PROVISION OF ALL SEDIMENT CONTROL MEASURES AS MAY BE REQUIRED TO PROTECT THE WORK SITE OR THE ADJACENT LANDS, REGARDLESS OF THE SOURCE OR ORIGIN OF EROSION OR SEDIMENTS. IF THE ENGINEER IS NOT SATISFIED WITH THE EXTENT OF THE MEASURES TAKEN, THE ENGINEER MAY DIRECT THAT ADDITIONAL CONTROLS BE PUT IN PLACE.

   THE ENGINEER'S REQUIREMENTS FOR SEDIMENT AND EROSION CONTROL SHALL BE CONSIDERED ABSOLUTE MINIMUMS. THE ULTIMATE RESPONSIBILITY TO ENSURE THAT THE MEASURES ARE ADEQUATE SHALL LIE SOLELY ON THE CONTRACTOR. ANY DAMAGE RESULTING FROM FAILURE OF THESE MEASURES SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
2. PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION.
3. ALL EROSION CONTROL MEASURES TO BE IN PLACE UNTIL ALL RESTORATION IS COMPLETE.
4. MAINTAIN EROSION CONTROL MEASURES DURING CONSTRUCTION.
5. MAINTAIN ALL STORMWATER CONVEYANCE SYSTEMS IN WORKING ORDER THROUGH MAINTENANCE OF EROSION CONTROL MEASURES.
6. ALL COLLECTED SEDIMENT TO BE DISPOSED OF AT AN APPROVED LOCATION.
7. MINIMIZE AREA DISTURBED DURING CONSTRUCTION.
8. ALL DEWATERING TO BE DISPOSED OF IN AN APPROVED SEDIMENTATION BASIN.
9. KEEP ALL SUMPS CLEAN DURING CONSTRUCTION.
10. PREVENT WIND-BLOWN DUST.







No.	DATE	ISSUED
1	07/06/2023	SECOND SUBMISSION TO COUNTY
2	08/03/2023	REVISED ROAD LAYOUT
3	09/07/2023	REVISED LOT WIDTHS
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No.	DATE	REVISION

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TOPOGRAPHICAL INFORMATION BY KIM HUSTED SURVEYING LTD, PLAN DATED DEC 2, 2021

ELEVATIONS ARE REFERRED TO CANADIAN GEODETIC DATUM, CGVD 1928 VERTICAL DATUM

BENCHMARKS

SITE BENCHMARK #1
ELEV: 200.14m
NAIL IN MAIL BOX POST LOCATED WEST OF THE SUBJECT PROPERTY, ON THE WEST SIDE OF FRONT ROAD

SITE BENCHMARK #2
ELEV: 199.45m
NAIL IN WOOD POST LOCATED ON THE SOUTH SIDE OF THE FRONT ROAD ENTRANCE TO THE SUBJECT PROPERTY

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PRELIMINARY
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SCALE 1:1250
25 50

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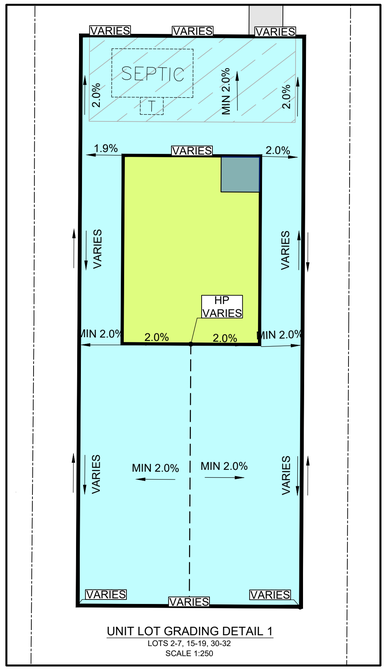
100189488
PROVINCE OF ONTARIO

Project Title
BB RANCH
VACATION RESORT
ST. WILLIAMS - NORFOLK COUNTY

Drawing Title
EXISTING AND REMOVAL PLANS

Designed by : N.B.N	Drawn By : N.B.N
Checked by : J.T.I.	Date Started : SEPTEMBER 2010
Drawing Scale : 1:1250	Drawing No. C103
Project No. 10-094	

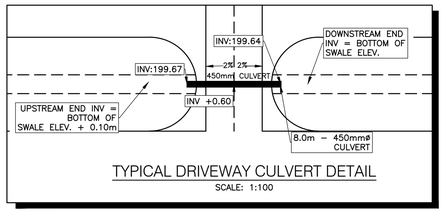
DATE LAST PLOTTED : December 8, 2023



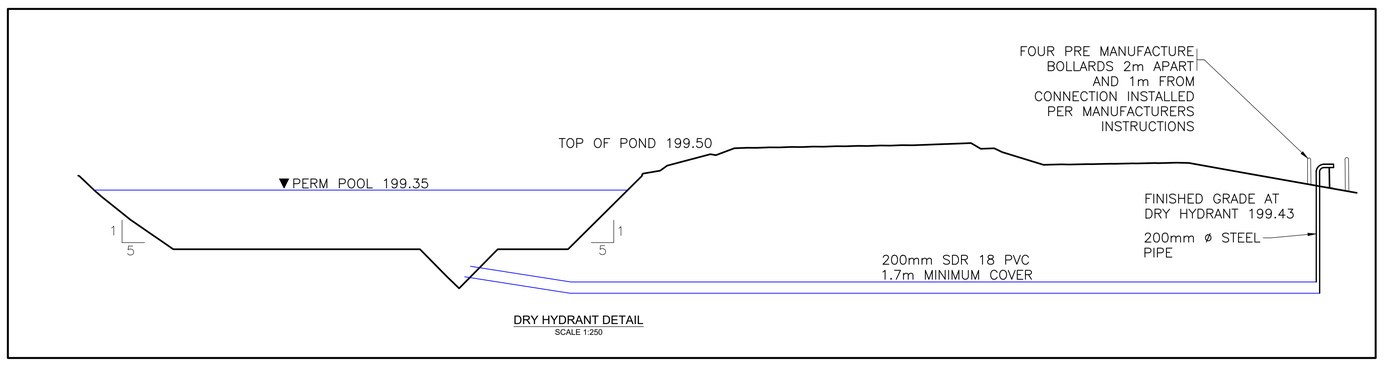
UNIT LOT GRADING DETAIL 1
LOTS 2-7, 15-19, 30-32
SCALE 1:250

UNIT LOT GRADING DETAIL 2
LOTS 8-14, 21-29
SCALE 1:250

UNIT LOT GRADING DETAIL 3
LOTS 33-40
SCALE 1:250



TYPICAL DRIVEWAY CULVERT DETAIL
SCALE: 1:100



DRY HYDRANT DETAIL
SCALE 1:250

No.	DATE	ISSUED
1	07/06/2023	SECOND SUBMISSION TO COUNTY
2	08/03/2023	REVISED ROAD LAYOUT
3	09/07/2023	REVISED LOT WIDTHS
4	12/05/2023	THIRD SUBMISSION TO COUNTY

No.	DATE	REVISION

NOTE:
THE CONTRACTOR IS CAUTIONED THAT ALL OF THE EXISTING UTILITIES ARE NOT INDICATED ON THIS DRAWING. THE CONTRACTOR MUST ARRANGE FOR LOCATES FROM EACH AREA UTILITY COMPANY PRIOR TO ANY CONSTRUCTION OR EXCAVATION. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE PROTECTION OF ALL UTILITIES INCLUDING THOSE NOT INDICATED ON THIS DRAWING. G. DOUGLAS VALLEE LTD. CANNOT ACCEPT RESPONSIBILITY FOR DAMAGE TO ANY EXISTING UTILITY WHICH MAY OR MAY NOT BE INDICATED ON THIS DRAWING.

ALL WORK, MATERIALS AND PROCESSES TO ABIDE TO MUNICIPAL STANDARDS AND SPECIFICATIONS.

TOPOGRAPHICAL INFORMATION BY KIM HUSTED SURVEYING LTD, PLAN DATED DEC 2, 2021

ELEVATIONS ARE REFERRED TO CANADIAN GEODETIC DATUM, CGVD 1928 VERTICAL DATUM

BENCHMARKS

SITE BENCHMARK #1
ELEV: 200.14m
NAIL IN MAIL BOX POST LOCATED WEST OF THE SUBJECT PROPERTY, ON THE WEST SIDE OF FRONT ROAD

SITE BENCHMARK #2
ELEV: 199.45m
NAIL IN WOOD POST LOCATED ON THE SOUTH SIDE OF THE FRONT ROAD ENTRANCE TO THE SUBJECT PROPERTY

SITE BENCHMARK #3
ELEV: 198.50m
NAIL IN HYDRO POLE LOCATED ON THE SOUTH SIDE OF THE EXISTING SECONDARY ENTRANCE TO THE SUBJECT PROPERTY.

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

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Consulting Engineers, Architects & Planners
G. DOUGLAS VALLEE LIMITED
2 TALBOT STREET NORTH
SIMCOE, ONTARIO N3Y 3W4
(519) 426-6270

Stamp
LICENSED PROFESSIONAL ENGINEER
2023.12.08
J. T. IEZZI
100189485
PROVINCE OF ONTARIO

Project Title
BB RANCH
VACATION RESORT
ST. WILLIAMS - NORFOLK COUNTY

Drawing Title
GENERAL NOTES AND DETAILS

Designed by : NBN	Drawn By : NBN
Checked by : JTI	Date Started : JANUARY 2022
Drawing Scale : AS SHOWN	Drawing No. C104
Project No. 10-094	

DATE LAST PLOTTED : December 8, 2023

BB RANCH VACATION RESORT

NORFOLK COUNTY

ESTIMATE COST AND SECURITIES

Project# 10-094
Rev0 - July 7, 2023
Rev1 - December 5, 2023

ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
A. STORMWATER							
1	Install 450mm culverts under all entrances in Municipal ROW	each	2	$1,500.00	$3,000	100%	$3,000
2	Install 450mm culverts under all driveways	each	39	$1,000.00	$39,000	10%	$3,900
	TOTAL STORMWATER				**$42,000**		**$6,900**
B. ROAD CONSTRUCTION							
1	Excavate, prepare and proof roll road sub excavation for proposed asphalt areas.	sq. m	7560	$8.00	$60,480	10%	$6,048
2	Saw-cut, remove existing surface and base asphalt in municipal ROW main site entrance and emergency access entrance.	L.S.	2	$1,500	$3,000	100%	$3,000
3	Supply, place and compact 350mm Granular 'B' for road in municipal ROW.	tonne	130	$30.00	$3,900	100%	$3,900
4	Supply, place and compact 350mm Granular 'B' for new roadway.	tonne	7570	$30.00	$227,100	10%	$22,710
5	Supply, place and compact 300mm Granular 'B' for parking area.	tonne	558	$25.00	$13,943	10%	$1,394
6	Supply, place and compact 150mm Gran. 'A' for road in municipal ROW.	tonne	60	$25.00	$1,500	100%	$1,500
7	Supply, place and compact 150mm Gran. 'A' for new roadway.	tonne	3000	$25.00	$75,000	10%	$7,500
8	Supply, place and compact 150mm Gran. 'A' for parking area.	tonne	260	$25.00	$6,500	10%	$650
9	Supply, place and compact 70mm of HL8 base asphalt pavement for road in the municipal ROW.	tonne	20	$140.00	$2,800	100%	$2,800
10	Supply, place and compact 70mm of HL8 base asphalt pavement for new roadway.	tonne	1460	$140.00	$204,400	10%	$20,440
11	Supply, place and compact 50mm of HL8 base asphalt pavement for parking area.	tonne	90	$120.00	$10,800	10%	$1,080
12	Supply, place and compact 50mm of HL3 top asphalt pavement for road in the municipal ROW.	tonne	17	$140.00	$2,380	100%	$2,380
13	Supply, place and compact 50mm of HL3 top asphalt pavement for new roadway.	tonne	1040	$140.00	$145,600	10%	$14,560
14	Supply, place and compact 40mm of HL3 top asphalt pavement for parking area.	tonne	70	$120.00	$8,400	10%	$840
	TOTAL ROAD CONSTRUCTION				**$765,803**		**$88,802**

ITEM	DESCRIPTION	UNIT	APPROX. QUANTITY	UNIT PRICE	AMOUNT	SECURITY %	SECURITY AMOUNT
C. EARTHWORKS							
1	Construct Fire Water Storage Pond	L.S	1	$20,000.00	$20,000	10%	$2,000
2	Grade road side swales to within 150mm of elevations shown on grading plan.	metre	1350	$5	$6,750	10%	$675
	TOTAL EARTHWORKS				**$26,750**		**$2,675**
D. HYDRO & STREET LIGHTING							
1	Allowance for installation of internal hydro servicing and street lighting system	L.S.	1	$50,000.00	$50,000	10%	$5,000
	TOTAL HYDRO & STREET LIGHTING				**$50,000**		**$5,000**
E. WATER							
1	Disconnect existing water service.	L.S	1	$1,000.00	$1,000	100%	$1,000
2	Connect new 25mm diameter PEX water serivce to existing water service at the propery line complete with new curb stop and connection to tracer wire.	L.S	1	$1,000.00	$1,000	100%	$1,000
2	Supply and install 25mm diameter PEX water serivce from property line to existing building.	metre	350	$150	$52,500	10%	$5,250
	TOTAL WATER				**$54,500**		**$7,250**
F. AS-BUILT DRAWINGS							
1	Prepare as-built drawings.	L.S	1	$2,000.00	$2,000	100%	$2,000
	TOTAL AS-BUILT DRAWINGS				**$2,000**		**$2,000**

SUMMARY

A.	**STORMWATER**	**$6,900**
B.	**ROAD CONSTRUCTION**	**$88,802**
C.	**EARTHWORKS**	**$2,675**
D.	**HYDRO & STREETLIGHTING**	**$5,000**
E.	**WATER**	**$7,250**
F.	**AS-BUILT DRAWINGS**	**$2,000**

GRAND TOTAL $112,627

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Consulting Engineers,
Architects & Planners

December 5, 2023

BB Investments Ltd.
436 Front Road
St. Williams, Norfolk County
ON N0E 1P0

Attention: **Jeff Bouck**

Reference: **Functional Servicing Report**
BB Ranch Vacation Resort
St. Williams, Norfolk County
Our Project # 10-094

Introduction

This Functional Servicing Report has been prepared in support of the site plan application required for the construction of the BB Ranch Vacation Resort located at 436 Front Road in St. Williams, Norfolk County. This report presents the functional serving for the proposed development, including sanitary servicing, stormwater management and domestic and fire water servicing.

Background

The subject property is approximately 23.6 ha and is located southwest of the community of St. Williams, Norfolk County. The site is bounded by Front Road to the northwest and southwest, a dense wooded valley and existing watercourse to the northeast and a shoreline bluff on the southeast side of the site leading to down to the coast of Lake Erie. Refer to Figure 1 in Appendix A.

The site currently features primarily agricultural fields and open landscaped area, with dense forested area on the east and south side of the site, several existing residential buildings and barns, and a gravel access road. The majority of the site is zoned as Agricultural (A), with a portion of the property along Lake Erie zoned as Hazard Land (HL) and Provincially Significant Wetland (PSW).

Due to the natural heritage features surrounding the subject site, it has been determined that the overall net developable area of the site is approximately 14.5 to 14.7 ha. These natural heritage features include the existing wooded valley lands, watercourse, shoreline bluff and an archeological discovery area. The proposed development shall consist of the following construction:

- 31 condominium lots;
- 8 tourist cabins condominium lots;
- An open-air pavilion building with washrooms;
- Water and sanitary infrastructure to support proposed construction;
- Stormwater management swales;
- Roads and other miscellaneous items to support proposed construction.

Stormwater Management

Complete details of the stormwater management design are detailed in the BB Ranch Vacation Resort Stormwater Management Report dated December 5, 2023.

Water Servicing

Norfolk County GIS online mapping and the Norfolk County ISMP indicate an existing 200mm diameter watermain along Front Road. Norfolk County's design criteria stipulates the following requirements for system pressures, and the system shall be designed to meet the greater of either of the following requirements;

- Fire flow conditions– not less than 140 kPa
- Normal operating conditions – not less than 280 kPa

Domestic Water Demand

The following summarizes the domestic water flow information for the proposed development:

- Equivalent Residential Population Density: 2.75 persons/unit
- Number of Units: 40 units
- Population: 110 people
- Average Daily Water Demand (per person): 0.450 m^3/person/day
- Maximum Day Demand Factor: 2.25
- Maximum Day Demand: 111.38 m^3/day (1.29 L/s)
- Peak Hourly Demand Factor (Residential): 4.00
- Peak Hourly Demand: 8.25 m^3/hour (2.29 L/s)

In summary, the proposed development is anticipated to have a total maximum daily demand of 1.29 L/s and a maximum hourly demand of 2.29 L/s. Refer to Appendix E for detailed calculations. It is understood that the existing 200mm watermain along Front Road is a distribution main and therefore, will not be utilized to provide new domestic water servicing to the proposed development. There is currently a single service connection from the existing watermain to the property. Under the proposed site development, it is proposed that the existing service remain and provide domestic water to one of the condo units. All other condo units will be serviced by on-site water cisterns.

Fire Water Service

According to Norfolk County GIS online mapping, there are no existing fire hydrants located in proximity to the subject development site.

Typically, available fire flow during the maximum day demand is the critical criterion when evaluating a watermain distribution system's ability to service a residential subdivision. The estimated fire flow requirement for the development has been determined using the recommendations of the Fire Underwriters Survey – 2020 (FUS) method and was determined to be 133 L/s. It is our opinion that the FUS guidelines yield an overly conservative requirement, and it should also be noted that the purpose of the FUS guideline is for fire insurance grading purposes, not meant for development.

It is understood that the existing 200mm watermain along Front Road is a distribution main and therefore, will not be utilized to provide fire water servicing to the proposed development. Consequently, it is proposed that on-site fire water storage pond will be utilized to provide the required fire fighting capacity. Using the FUS criteria, approximately 1080 m^3 is required. The proposed fire water storage pond has a total storage volume of 1235 m^3. Supporting calculations are detailed in Appendix E.

Sanitary Servicing

The subject property does not have access to municipal sanitary services. Therefore, it is proposed that each building be serviced by individual, on-site septic systems.

County staff have provided comments requesting the proponent coordinate with the MECP to review the proposal of individual septic systems and discuss the potential requirement for a Municipal Responsibility Agreement (MRA). The proponent, with support for the septic design consultant (MTE Consultants Inc.), have reviewed the development with the Ministry. It is the MECP's position that this project does not fall under our jurisdiction requiring a Sewage Works Approval under S. 53(1) of the Ontario Water Resources Act, provided that none of the individual systems exceed 10,000L/day design flow. As such, the MECP has noted that they will not have further involvement in the review or approval of these systems. Correspondence between the proponent and the MECP is provided in Appendix C.

Conclusions and Recommendations

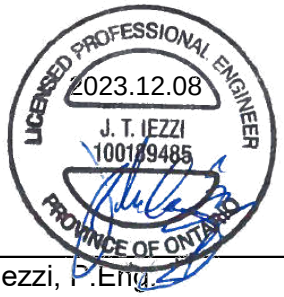
The functional servicing design for the proposed development can be summarized as follows:

- Complete details of the stormwater management design are detailed in the BB Ranch Vacation Resort Stormwater Management Report dated December 5, 2023.
- Each proposed building will be serviced by an on-site sanitary septic system, which will be designed by others.
- On-site water cisterns will be used to provide domestic water servicing and will be designed by others as part of the detailed design process.
- The domestic maximum day demand and peak hourly demand were found to be 111.38 m^3/day (1.29 L/s) and 8.25 m^3/hour (2.29 L/s), respectively.
- The required fire flow demand for the proposed development was found to be 133 L/s using the FUS criteria.
- The required fire water storage for the proposed development was found to be 1080 m^3 using the FUS criteria. An on-site fire water storage pond with a volume of 1235 m^3 will be utilized to provide the required fire fighting capacity.

It is recommended that this report be provided to Norfolk County and the Long Point Region Conservation Authority in support of the site plan application for the proposed development.

We trust that this information is complete and sufficient for submission. Should you have any questions or require further information please do not hesitate to contact the undersigned.

Respectfully submitted,



Natalie Biesinger, B.A.Sc., EIT
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

John Iezzi, P.Eng.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

Appendix A
– 10-094 FIG1 – Site Location Plan

Appendix B
– Domestic Water Demand Calculations
– FUS Calculations
– Required Fire Water Storage
– 10-094 FIG4 – Fire Flow Distances

Appendix C
– E-Mail Correspondence with the MECP on proposed septic systems

APPENDIX A

10-094 FIG1 – Site Location Plan

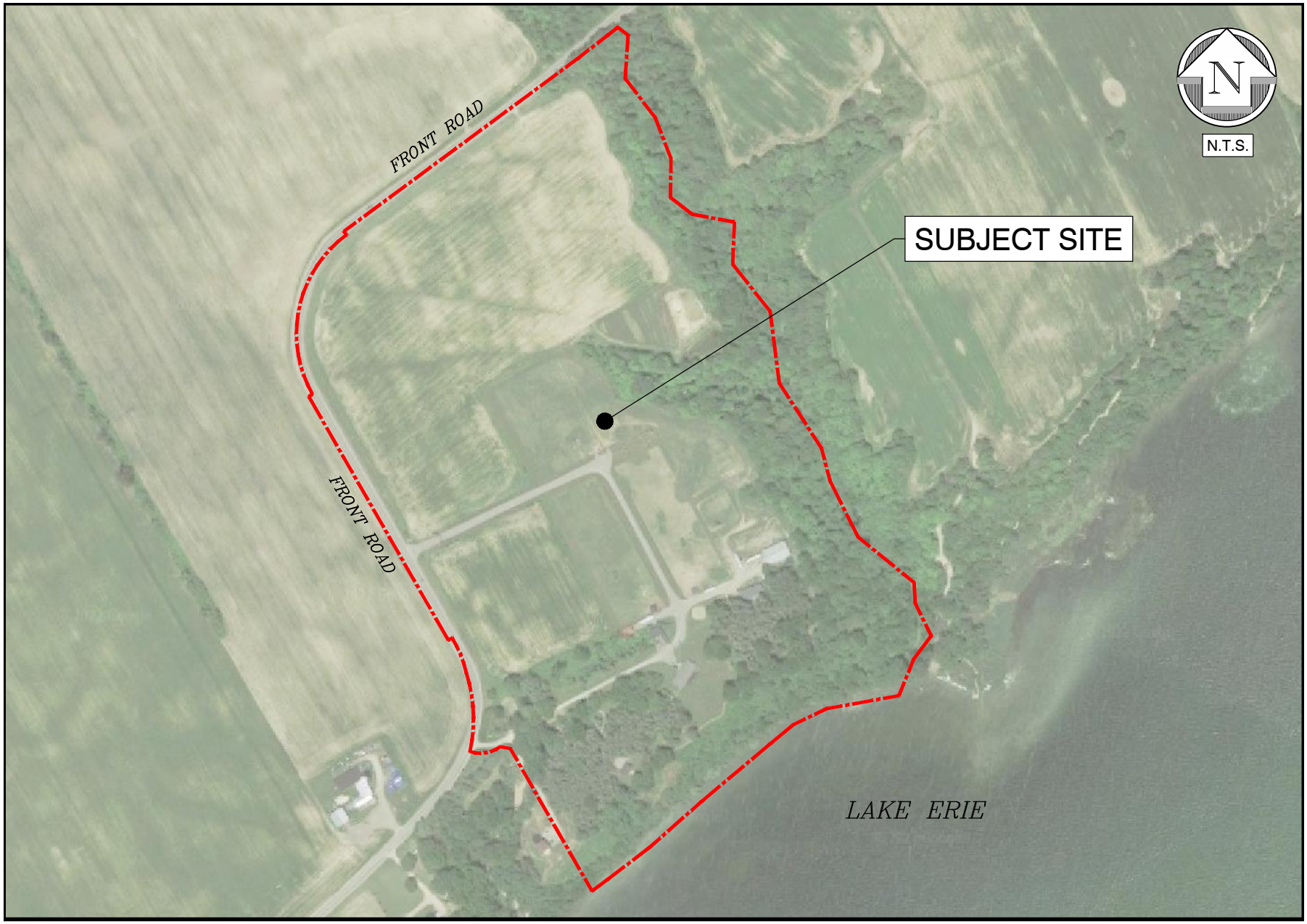


FIG 1 - SITE LOCATION PLAN

APPENDIX B

Domestic Water Demand Calculations
FUS Calculations
Required Fire Water Storage
10-094 FIG4 – Fire Flow Distances

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Subject:	BB Ranch Vacation Resort		
Date:	3/15/2023	By:	TJC
Project #:	10-094	Page	1

Maximum Daily Demand

Total Number of Units	40	units
Use of Land	Residential	
Equiv. Population Density	2.75	ppl/unit
Equiv. Population	110	
Av. Daily Demand Per Capita	0.45	m^3/capita/day
Maximum Daily Demand Peaking Factor	2.25	
Maximum Daily Demand	111.38	m^3/day
	1.29	l/s

Maximum Hourly Demand

Total Number of Units	40	units
Zoning of Land	Residential	
Equiv. Population Density	2.75	ppl/ha
Equiv. Population	110	
Av. Daily Demand Per Capita	0.45	m^3/capita/day
Maximum Hourly Demand Peaking Factor	4	
Maximum Hourly Demand	8.25	m^3/hour
	2.29	l/s

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Consulting Engineers, Architects & Planners

Subject:	BB Ranch Vacation Resort		
Date:	Dec-23	By:	NLB
Project #:	10-094	Page:	1

LOT 3

1) Fire Flow Requirement

$F_1=220C(A^{1/2})$ (L/min)

C= 1.5 Construction coefficient for wood frame construction

A= 2400 sq. ft = Assumed Building Footprint

A= 223 Floor Area m^2 = Main Floor Area Building

= 446 Fire Area m^2 = Main Floor Area Building + 2nd Floor

F_1= 6969 L/min

F_1= 7000 L/min (Round to the nearest 1,000 l/min)

2) Occupancy

Occupancy Type: Residential Occupancy

Reduction: 15%

Surcharge: 0%

$F_2=F_1+(F_1*Reduction/Surcharge)$ (L/min)

F_2= 5950 L/min

3) Sprinkler System

Sprikler System: Not Applicable (assumed no sprinkler system in service)

Reduction: 0%

$F_3=F_2*Reduction$ (L/min)

F_3= 0 L/min

4) Seperation

Location	Direction	Distance (m)	Surcharge
Front	East	> 30m	0%
Side	North	14.8	15%
Side	South	12.1	15%
Rear	West	> 30m	0%
		Total:	30%

Separation Surcharges	
0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

F4=(TOTAL)*F2 (L/min)

F_4= 1785 L/min

Total Fire Flow

$F=F_2-F_3+F_4$ = 7735 L/min

= 8000 L/min (Round to the nearest 1,000 l/min)

= **133.3 L/s**

Notes: *1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 2020*

LOT 36

1) Fire Flow Requirement

$F_1=220C(A^{1/2})$ (L/min)

C= 1.5 Construction coefficient for wood frame construction

A= 2068 sq. ft = Assumed Building Footprint

A= 192 Floor Area m^2 = Main Floor Area Building

= 384 Fire Area m^2 = Main Floor Area Building + 2nd Floor

F_1= 6469 L/min

F_1= 6000 L/min (Round to the nearest 1,000 l/min)

2) Occupancy

Occupancy Type: Residential Occupancy

Reduction: 15%

Surcharge: 0%

$F_2=F_1+(F_1*Reduction/Surcharge)$ (L/min)

F_2= 5100 L/min

3) Sprinkler System

Sprikler System: Not Applicable (assumed no sprinkler system in service)

Reduction: 0%

$F_3=F_2*Reduction$ (L/min)

F_3= 0 L/min

4) Seperation

Location	Direction	Distance (m)	Surcharge
Front	East	>30	0%
Side	North	3.0	25%
Side	South	3.0	25%
Rear	West	>30	0%
		Total:	50%

Separation Surcharges	
0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

F4=(TOTAL)*F2 (L/min)

F_4= 2550 L/min

Total Fire Flow

$F=F_2-F_3+F_4$ = 7650 L/min

= 8000 L/min (Round to the nearest 1,000 l/min)

= **133.3 L/s**

Notes: *1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 2020*

Water Supply for Public Fire Protection - Fire Underwriters Survey 2020
Tables & Figures

Method for Determining Required Fire Flows

Fire Underwriters Survey defines **Required Fire Flow** as the amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure. This may include as much as a city block.

To determine the estimated amount of water required to confine and control a fire in a building or group of buildings, Fire Underwriters Survey uses the following base formula:

$$RFF = 220C\sqrt{A}$$

Where:

RFF = the Required Fire Flow in litres per minutes (LPM)
C = the Construction Coefficient is related to the type of construction of the building
A = the Total Effective Floor Area (effective building area) in square metres of the building

Construction Coefficient (C)

Note that the construction typology used by the insurance industry and public fire protection differs from the terms of reference in the National Building Code of Canada (NBC).

The following Construction Types and Coefficients are used in the required fire flow formula:

C = 1.5 for **Type V** Wood Frame Construction
= 0.8 for **Type IV-A** Mass Timber Construction
= 0.9 for **Type IV-B** Mass Timber Construction
= 1.0 for **Type IV-C** Mass Timber Construction
= 1.5 for **Type IV-D** Mass Timber Construction
= 1.0 for **Type III** Ordinary Construction
= 0.8 for **Type II** Noncombustible Construction
= 0.6 for **Type I** Fire Resistive Construction

Occupancy and Contents Adjustment Factor

The required fire flow may be reduced by as much as -25% for occupancies having contents with a very low fire hazard or may be increased by up to 25% for occupancies having contents with a high fire hazard. The Occupancy and Contents Adjustment Factor should not be made at greater than 25% or less than -25%.

- *Noncombustible Contents* *-25%*
  - Includes merchandise or materials, including stock, or equipment, which in permissible quantities does not in themselves constitute an active fuel for the spread of fire.
  - May include limited or controlled amounts of combustible material, not exceeding 5% of the Total Effective Area of the occupancy. Combustible components of construction (ex. interior walls, finishes, etc.) should be included in the limit on combustible materials.
- *Limited Combustible Contents* *-15%*
  - Includes merchandise or materials, including furniture, stock, or equipment, of low combustibility, with limited concentrations of combustible materials.
- Combustible Contents 0% no adjustment
  - Includes merchandise or materials, including furniture, stock, or equipment, of moderate combustibility.
- *Free Burning Contents* *+15%*
  - Includes merchandise or materials, including furniture, stock, or equipment, which burn freely, constituting an active fuel.
- *Rapid Burning Contents* *+25%*
  - Includes merchandise or materials, including furniture, stock, or equipment, which either
    - Burn with great intensity
    - spontaneously ignite and are difficult to extinguish
    - give off flammable or explosive vapors at ordinary temperatures
    - as a result of an industrial processing, produce large quantities of dust or other finely divided debris subject to flash fire or explosion

Table 3 Recommended Occupancy/Contents Charges by Major Occupancy Examples[1]

Group	Division	Description of Major Occupancies	Occupancy and Contents	Adjustment Factor
A	1	***Assembly** occupancies* intended for the production and viewing of the performing arts	Combustible	0%
A	2	***Assembly** occupancies* not elsewhere classified in Group A	Limited to Combustible	-15% to 0%
A	3	***Assembly** occupancies* of the arena type	Limited to Combustible	-15% to 0%
A	4	***Assembly** occupancies* in which occupants are gathered in the open air	Limited to Combustible	-15% to 0%
B	1	**Detention** occupancies	Noncombustible to Limited	-25% to -15%
B	2	**Care** and treatment occupancies	Noncombustible to Limited	-25% to -15%
B	3	**Care** occupancies	Limited	-15%
C	---	**Residential** occupancies	Limited	-15%
D	---	**Business** and personal services occupancies		
D	---	• *Police stations without detention quarters*	Non-combustible	-20%
D	---	• *Banks, Barber and hairdressing shops, Beauty parlours, Dental offices, Laundries (self-service), Medical offices, Offices, Radio stations*	Limited	-15%
D	---	• *Dry cleaning establishments (self-service, not using flammable or explosive solvents or cleaners), Small tool and appliance rental and service establishments*	Combustible	0%
E	---	**Mercantile** occupancies		
E	---	• *Exhibition halls*	Limited	-15%
E	---	• *Supermarkets*	Limited	-15%
E	---	• *Shops/Stores*	Limited to Combustible	-15% to 0%
E	---	• *Markets*	Combustible	0
E	---	• *Department stores*	Free Burning	15%
F	1	**High hazard industrial** occupancies	Rapid Burning	+25%
F	2	**Medium hazard industrial** occupancies		
F	2	• *Television studios not admitting a viewing audience*	Limited	-15%
F	2	• *Cold storage plants*	Combustible	0%
F	2	• *Electrical substations*	Combustible	0%
F	2	• *Helicopter landing areas on roofs*	Limited	-15%

[1] *The values presented in this table are intended as a guideline and the occupancy/contents adjustment should be based on the actual severity of conditions within the risk structure.*

Total Effective Area (A)

To determine a required fire flow for an individual building, the Total Effective Area that would be affected during the design fire must be determined. The Total Effective Area is the largest Floor Area (in square metres) plus the following percentages of the total area of the other floors:

1) For a building classified with a Construction Coefficient from 1.0 to 1.5:
   a) 100% of all Floor Areas are considered in determining the Total Effective Area to be used in the formula.
2) For a building classified with a Construction Coefficient below 1.0:
   a) if any vertical openings in the building (ex. interconnected floor spaces, atria, elevators, escalators, etc.) are unprotected, consider the two largest adjoining floor areas plus 50% of all floors immediately above them up to a maximum of eight; or
   b) if all vertical openings and exterior vertical communications are properly protected in accordance with the National Building Code, consider only the single largest Floor Area plus 25% of each of the two immediately adjoining floors.

Automatic Sprinkler Protection

The required fire flow may be reduced by up to 50 percent for complete Automatic Sprinkler Protection depending upon adequacy of the system. Where only part of a building is protected by Automatic Sprinkler Protection, credit should be interpolated by determining the percentage of the Total Floor Area being protected by the automatic sprinkler system.

To be able to apply the full 50 percent reduction, the following areas should be reviewed to determine the appropriate level of credit for having Automatic Sprinkler Protection as per the table below:

Table 4 Sprinkler Credits

Automatic Sprinkler System Design	Credit	
	With complete building coverage	With partial building coverage of X%
Automatic sprinkler protection designed and installed in accordance with NFPA 13	30%	30% × Percentage of Total Floor Area Serviced by Sprinkler System
Water supply is standard for both the system and Fire Department hose lines	10%	10% × Percentage of Total Floor Area Serviced by Sprinkler System
Fully supervised system	10%	10% × Percentage of Total Floor Area Serviced by Sprinkler System

Exposure Adjustment Charge

A percentage of water for the exposures should be added to the required fire flow for the subject building to provide adequate flow rates for hose streams used to reduce the spreading of fire from the subject building to exposed risks (ex. structures, stored materials, forest, etc.). The required fire flow of a subject building may be increased depending on the severity of exposed risks to the subject building and the distance between the exposed risks and the subject building. This charge considers the usage of water supplies to prevent exposed risks from igniting or being damaged during a major fire incident in the subject building.

The maximum Exposure Adjustment Charge to be applied to a subject building is 75% when summing the percentages for all sides of the building. Table 5 outlines the maximum Exposure Adjustment Charge to apply for any one side of the subject building based on the following separation distances between the subject building and the exposed risk (aka. exposure):

Table 5 Exposure Charges

Separation Distance	Maximum Exposure Adjustment Charge
0 m to 3 m	25%
3.1 m to 10 m	20%
10.1 m to 20 m	15%
20.1 m to 30 m	10%
Greater than 30	0%

Table 6 Exposure Adjustment Charges for Subject Building considering Construction type of Exposed Building Face

Distance (m) to the Exposure	Length-height factor of exposing building face	Type V	Type III-IV[2]	Type III-IV[3]	Type I-II[2]	Type I-II[3]
0 to 3	0-20	20%	15%	5%	10%	0%
	21-40	21%	16%	6%	11%	1%
	41-60	22%	17%	7%	12%	2%
	61-80	23%	18%	8%	13%	3%
	81-100	24%	19%	9%	14%	4%
	Over 100	25%	20%	10%	15%	5%
3.1 to 10	0-20	15%	10%	3%	6%	0%
	21-40	16%	11%	4%	7%	0%
	41-60	17%	12%	5%	8%	1%
	61-80	18%	13%	6%	9%	2%
	81-100	19%	14%	7%	10%	3%
	Over 100	20%	15%	8%	11%	4%
10.1 to 20	0-20	10%	5%	0%	3%	0%
	21-40	11%	6%	1%	4%	0%
	41-60	12%	7%	2%	5%	0%
	61-80	13%	8%	3%	6%	1%
	81-100	14%	9%	4%	7%	2%
	Over 100	15%	10%	5%	8%	3%
20.1 to 30	0-20	0%	0%	0%	0%	0%
	21-40	2%	1%	0%	0%	0%
	41-60	4%	2%	0%	1%	0%
	61-80	6%	3%	1%	2%	0%
	81-100	8%	4%	2%	3%	0%
	Over 100	10%	5%	3%	4%	0%
Over 30 m	all sizes	0%	0%	0%	0%	0%

FUS REQUIRED FIRE WATER STORAGE

Maximum Total Fire Flow Required: **8000 L/min**

Table 1 Required Duration of Fire Flow

Fire Flow Required (litres per minute)	Duration(hours)
2,000 or less	1.0
3,000	1.25
4, 000	1.5
5,000	1.75
6,000	2.0
8,000	2.0
10,000	2.0
12,000	2.5
14,000	3.0
16,000	3.5
18,000	4.0
20,000	4.5
22,000	5.0
24,000	5.5
26,000	6.0
28,000	6.5
30,000	7.0
32000	7.5
34,000	8.0
36,000	8.5
38,000	9.0
40,000 and over	9.5

** Interpolate for intermediate figures*

Required Duration: 2 hr
120 min

Total Required Storage Volume: 960000 L
960.0 m^3

Provided Fire Flow Pond Storage: **1235 m^3** ✓

No.	DATE	ISSUED
0	12/05/2023	THIRD SUBMISSION TO COUNTY

No.	DATE	REVISION

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ALL WORK, MATERIALS AND PROCESSES TO ABIDE TO MUNICIPAL STANDARDS AND SPECIFICATIONS.

TOPOGRAPHICAL INFORMATION BY KIM HUSTED SURVEYING LTD, PLAN DATED DEC 2, 2021

ELEVATIONS ARE REFERRED TO CANADIAN GEODETIC DATUM, CGVD 1928 VERTICAL DATUM

SCALE 1:1000
0 25 50

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2 TALBOT STREET NORTH
SIMCOE, ONTARIO N3Y 3W4
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Project Title
BB RANCH
VACATION RESORT
ST. WILLIAMS - NORFOLK COUNTY

Drawing Title
POST-DEVELOPMENT SWM FIRE FLOW DISTANCES

Designed by :	Drawn By :
NLB	NBN
Checked by :	Date Started :
JTI	JANUARY 2022
Drawing Scale :	Drawing No.
1:1000	FIG4
Project No.	
10-094	

DATE LAST PLOTTED : December 5, 2023

APPENDIX C

E-Mail Correspondence with the MECP on proposed septic systems

John Iezzi

From: O'Connor, Chris (MECP) <Chris.O'Connor2@ontario.ca>
Sent: Friday, June 16, 2023 2:51 PM
To: Jeff Bouck
Cc: Rebecca Bouck; Robb Bouck; Wendy Newton; Andrew Bingaman; John Vallee; John Iezzi
Subject: RE: BB Ranch - PIN & Roll # confirmation

Hi Jeff, I am providing you copy of the email I just sent to the County (Planning and Building Departments) for your records. Thank you again for your patience as we worked through this. Have a great weekend.

I apologize for the delay in response but this was an issue I wanted to make sure we have a serious look at internally here at the ministry.

Based on our discussions and correspondence, and recent discussion and correspondence with Jeff Bouk, it is the MECP's position that this project does not fall under our jurisdiction requiring a Sewage Works Approval under S. 53(1) of the Ontario Water Resources Act, provided that none of the individual systems exceed 10,000L/day design flow.

Mr. Bouk has provided written confirmation that each "unit" on the lot has an individual PIN which satisfies the "single lot or parcel" clause under our legislation. Therefore the aggregate total flow of systems on the property does not apply. He has also confirmed the sizing of the system serving the restaurant building will be approximately 6000 L/day which falls under the OBC (additionally this unit is on it's own PIN.)

The Ministry of Municipal Affairs and Housing has also confirmed existing case law of a similar development proposal (Vacant Land Condominium Plan) which was captured under municipal/OBC sewage permitting. Therefore we will not have further involvement in review or approval of these systems.

If you have any further question please feel free to get in touch.

Christopher O'Connor
Provincial Officer #1395

From: Jeff Bouck <jeff@bouckinc.com>
Sent: June-16-23 12:57 PM
To: O'Connor, Chris (MECP) <Chris.O'Connor2@ontario.ca>
Cc: Rebecca Bouck <rebecca@bouckinc.com>; Robb Bouck <robb@bouckinc.com>; Wendy Newton <wnewton@boddy-ryerson.com>; Andrew Bingaman <abingeman@mte85.com>; John Vallee <johnvallee@gdvallee.ca>; John Iezzi <johniezzi@gdvallee.ca>
Subject: BB Ranch - PIN & Roll # confirmation

Hello Chris

Please find our "updated" confirmation letter, as well as a supporting letter from our lawyer.

Please confirm receipt.

Have a super weekend.

Jeff

Jeff Bouck, 519-865-3030 - jeff@bouckinc.com

For God so loved the world that he gave his one and only Son, that whoever believes in him shall not perish but have eternal life. John 3:16

vallee

Consulting Engineers,
Architects & Planners

December 5, 2023

BB Investments Ltd.
436 Front Road
St. Williams, Norfolk County
ON N0E 1P0

Attention: **Jeff Bouck**

Reference: **Stormwater Management Report**
BB Ranch Vacation Resort
St. Williams, Norfolk County
Our Project # 10-094

Introduction

This Stormwater Management Report has been prepared in support of the site plan application required for the construction of the BB Ranch Vacation Resort located at 436 Front Road in St. Williams, Norfolk County. It is the intention to submit this report to Norfolk County and the Long Point Region Conservation Authority (LPRCA) for review and approval of the proposed Site Plan.

Background

The subject property is approximately 23.6 ha and is located southwest of the community of St. Williams, Norfolk County. The site is bounded by Front Road to the northwest and southwest, a dense wooded valley and existing watercourse to the northeast and a shoreline bluff on the southeast side of the site leading to down to the coast of Lake Erie. Refer to Figure 1 in Appendix A.

The site currently features primarily agricultural fields and open landscaped area, with dense forested area on the east and south side of the site, several existing residential buildings and barns, and a gravel access road. The majority of the site is zoned as Agricultural (A), with a portion of the property along Lake Erie zoned as Hazard Land (HL) and Provincially Significant Wetland (PSW).

Stormwater Management Design Criteria

The design criteria provided by the LPRCA for the proposed development are as follows:

- Quality Control: Stormwater to be treated to the Enhanced Protection Level as defined in the MOECC Ministry of Environment and Climate Change Design Manual - March 2003.
- Quantity Control: For areas proposed to outlet over the ravine to the north of the property, quantity control is to maintain pre-development runoff. For areas proposed to outlet directly to Lake Erie, no quantity control is required but the site shall be designed to ensure no increase to erosion.

The Norfolk County rainfall IDF curve data used for the storm analysis using the parameters in Table 1 below.

Table 1
Norfolk County Rainfall IDF Parameters

Event	A	B	C
2-year	529.711	4.501	0.745
5-year	583.017	3.007	0.703
10-year	670.324	3.007	0.698
25-year	721.533	2.253	0.679
50-year	766.038	1.898	0.668
100-year	801.041	1.501	0.657

Pre-Development Condition

Under existing conditions, the subject property is composed of existing agricultural land, open landscaped area, dense forested area, and features several existing buildings. All stormwater runoff from the pre-development site ultimately discharges to Lake Erie at the south end of the property, however, the pre-development site can be generally divided into three catchment areas as shown in Figure 2 in Appendix A. Runoff from each drainage area is conveyed to Lake Erie via the drainage routes described below.

- Area EXT-1
  - Runoff from pre-development external drainage area 1 (EXT-1) is conveyed uncontrolled, overland in an easterly direction towards the existing wooded valley located along the east limit of the subject property.
  - Runoff ultimately discharges to Lake Erie via the existing watercourse in the valley.
- Area PRE-A
  - Runoff from pre-development drainage area A (PRE-A) is conveyed uncontrolled, overland in a south-easterly direction towards the southeast corner of the property.
  - Runoff is then conveyed down to Lake Erie via a rip-rap trench alongside the existing gravel access road, referred to as Outlet A.
- Area PRE-B
  - Runoff from pre-development drainage area B (PRE-B) is conveyed uncontrolled, overland in a south-westerly direction towards the existing roadside ditch along the east side of Front Road where it is routed to an existing catch basin at the southwest corner of the property.
  - Runoff is then conveyed via a combination of overland flow and a 450mm dia. culvert to the existing gravel access road located on the property of 434 Front Road, where it ultimately releases to Lake Erie, referred to as Outlet B.

Post-Development Conditions

Under post-development conditions, runoff from the site is directed to each of the drainage outlets identified above, where it is ultimately released to Lake Erie as it is under pre-development conditions. The post-development catchment areas and drainage outlets are presented in Figure 3 in Appendix A, and are described below.

- Area EXT-1
  - Runoff from post-development external drainage area 1 (EXT-1) is conveyed uncontrolled, overland in an easterly direction towards the existing wooded valley located along the east limit of the subject property as it does under pre-development conditions. The post-development external area discharging to the wooded valley is less than under pre-development conditions.
- Outlet A
  - Outlet A receives runoff from post-development areas A1, A2 and A3.
  - Runoff from A1, A2 and A3 is conveyed to Outlet A via a system of proposed enhanced grass swales.
- Outlet B
  - Outlet B receives runoff from post-development areas B1, B2, B3, B4, B5 and B6.
  - Runoff from B1, B2, B3 and B4 is conveyed to Outlet B via a system of proposed enhanced grass swales.
  - Runoff from B5 is conveyed to Outlet B via the existing roadside ditch along Front Road (as it does under pre-development conditions) and the system of proposed enhanced grass swales.
  - Runoff from B6 is conveyed to Outlet B via overland flow to the existing catch basin at the southwest corner of the property.

Table 1 and Table 2 present the catchment parameters used to analyze the post-development systems in Visual OTTHYMO, for Outlet A and Outlet B, respectively. The corresponding soil information and catchment parameter calculations can be found in Appendix B and Appendix C, respectively.

Table 1
Outlet A - Post-Development Catchment Parameters

Parameter	A1	A2	A3
Hydrologic Soil Group/ Soil Type	Soil Group C – Mainly Silty Clay Loam Till with Imperfect Drainage		
SCS Curve Number	82		
Initial Abstraction (mm)	4.2 mm		
Design Infiltration Rate (mm/hr)	4.8 mm/hr		
Catchment Area (ha)	2.23	0.77	1.64
Impervious Percentage (%)	25%	31%	0%
Runoff Coefficient	N/A	N/A	0.25
Time to Peak (hr)	N/A	N/A	0.27

Table 2 Outlet B - Post-Development Catchment Parameters						
Parameter	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**
Hydrologic Soil Group/ Soil Type	Soil Group C – Mainly Silty Clay Loam Till with Imperfect Drainage					
SCS Curve Number	82					
Initial Abstraction (mm)	4.2 mm					
Design Infiltration Rate (mm/hr)	4.8 mm/hr					
Catchment Area (ha)	2.60	0.83	0.56	2.53	0.90	1.73
Impervious Percentage (%)	27%	8%	33%	5%	35%	0%
Runoff Coefficient	N/A	0.30	N/A	0.28	N/A	0.25
Time to Peak (hr)	N/A	0.23	N/A	0.44	N/A	0.41

Quality Control

The selection of the level of water quality treatment is based on the proposed stormwater outlet. For this site, it is proposed that stormwater will discharge to Lake Erie. Consequently, an enhanced protection level has been selected as the quality control target for the proposed development, corresponding to a long-term removal of 80% of total suspended solids (TSS) as defined in the *MOE Stormwater Management Planning and Design Manual (2003).*

The stormwater quality control target for the proposed development will be achieved using a system of enhanced grass swales, which are vegetated open channels designed to convey, treat, and attenuate stormwater runoff from catchments A1, A2, B1, B2, B3 and B4. First, the treatment process begins with post-development flows draining overland towards the proposed roadside swales. Site grading has been designed to flatten slopes, lengthen overland flow paths and maximize sheet flow, reducing the potential for erosion and sediment transport before entering the enhanced grass swales. Next, the vegetation in the enhanced grass swales reduces the flow velocity of the runoff to allow sedimentation and filtration to occur. Driveway culverts will be raised such that the driveway embankment (up to the invert of the culvert) acts as a check dam, which will further slow the flow rate in the swales, reduce the potential for erosion, and promote infiltration to occur.

The *MOE Stormwater Management Planning and Design Manual (2003)* and the *CVC Low Impact Development Stormwater Management Planning and Design Guide (2010)* present numerous design guidelines and water quality treatment requirements related to the geometry and layout of enhanced grass swales, to ensure an enhanced level of water quality treatment is achieved. Table 3 presents these design guidelines and requirements, and the corresponding proposed design for each of the three enhanced swales. The peak flow rates during the 4-hour, 25mm Chicago storm event were determined using Visual OTTHYMO. The corresponding flow depth and velocity calculations, and model output file are detailed in Appendix C and D, respectively.

Table 3 Enhanced Swale Guidelines & Requirements and Proposed Design							
Design Guidelines & Requirements		**Proposed Design**					
		A1	**A2**	**B1+B2**	**B3**	**B4**
Design Guidelines	**Shape:** trapezoidal or parabolic cross section.	Trapezoidal				
	Swale Length Between Culverts: > 5.0m	Minimum Length: 5.8m				
	Bottom Width: 0.75m to 3.0m	1.0m				
	Longitudinal Slope: 0.5% to 4.0%, < 1.0% preferred	0.50%	0.55%	0.50%	0.55%	1.0%
	Side Slope: maximum 2.5:1, 4:1 preferred	4:1				
	Impervious Area to Pervious Swale Footprint: maximum 10:1, 5:1 preferred for C and D type soils	2.7:1	7.2:1	3.6:1	4.8:1	1.7:1
	Check Dam Height: Determined by the depth of water that will infiltrate in 24 to 48 hours. For this site, the maximum height is 115mm based on the design infiltration rate and a drawdown time of 24 hours.	Maximum: 100mm (Inlet of driveway culvert to be installed 100mm off bottom of swale)				
	Contributing Slopes (Surrounding Swale): 1.0% to 5.0%	0.5% to 5.0%				
Water Quality Treatment Requirements	**Flow During 4-hour, 25mm Chicago Storm Event:** < 0.15 m^3/s	0.035 m^3/s	0.014 m^3/s	0.056 m^3/s	0.013 m^3/s	0.032 m^3/s
	Velocity During 4-hour, 25mm Chicago Storm Event: < 0.50 m^3/s	0.41 m/s	0.31 m/s	0.47 m/s	0.31 m/s	0.37 m/s
	Flow Depth During 4-hour, 25mm Chicago Storm Event: < 100mm	67mm	39mm	88mm	38mm	31mm

Based on the design guidelines/requirements and proposed design details presented in Table 3, it can be concluded that the proposed enhanced grass swales will provide adequate water quality treatment required to achieve a long-term removal of 80% of total suspended solids. In addition, it should be noted that it is anticipated that the site stormwater runoff will have significantly fewer pollutants as compared to a standard road, due to the minimal levels of traffic activity anticipated in the proposed development.

Quantity Control

As under pre-development conditions, the outlet for the modified, post-development catchments is directly to Lake Erie, therefore no quantity control is proposed. However, as recommended in the *MOE Stormwater Management Planning and Design Manual (2003)* and the *CVC Low Impact Development Stormwater Management Planning and Design Guide (2010),* it is recommended that swales be designed to convey the 10-year storm event at non-erosive velocities (less than 1 m/s). In addition, all swales have been sized to adequately convey flows during 100-year storm event.

Using Visual OTTHYMO, the peak 10-year and 100-year storm event flow rates to each swale, including the combined outlet swales were determined. Table 4 presents the maximum capacity of each swale, the 100-year flow rate to each swale, and the flow velocities achieved during the 10-year storm event for each swale.

Table 4
Quantity Control Swale Performance

Swale	Max. Capacity (m^3/s)	100-Year Flow (m^3/s)	10-Year Velocity (m/s)
A1	1.87	0.44	0.70
A2	1.96	0.16	0.56
B1 + B2	1.87	0.61	0.78
B3	1.96	0.12	0.52
B4	2.65	0.22	0.77
Outlet A Swale (A1+A2+A3)	1.05	0.75	0.54
Outlet B Swale (B1+B2+B3+B4+B5)	1.52	1.06	0.78

In conclusion, the proposed swales provide adequate capacity to convey flows during the 100-year storm event and the 10-year storm event flows, at non-erosive velocities, less than 1 m/s.

Final Outlet Capacity

Outlet A
Outlet A receives runoff from catchments A1, A2 and A3 and consists of an existing 0.35m deep by 1.2 wide rip-rap trench, and 2.5m gravel access road which leads down to Lake Erie. Prior to discharging to Lake Erie, stormwater will confluence at an existing 2.0m wide rip-rap channel, which then releases to the lake. Table 5 presents the maximum capacity of the rip-rap trench, the capacity contained within the road width, the total combined capacity of the trench and road, the capacity of the final outlet channel, and the 10-year and 100-year flow rate experienced at Outlet A.

Table 5
Outlet A Performance

Maximum Trench Capacity	0.40 m^3/s
Maximum Road Width Capacity	0.47 m^3/s
Combined Trench & Road Capacity	0.87 m^3/s
Final Outlet Channel Capacity	0.77 m^3/s
10-Year Flow Rate	0.38 m^3/s
100-Year Flow Rate	0.75 m^3/s

As presented above, the rip-rap trench provides adequate capacity to convey the peak 10-year flow rate, and the 100-year storm event is adequately conveyed within the trench and road width.

To ensure the existing final Outlet A rip-rap channel is adequately sized to prevent erosion, rip-rap sizing calculations in accordance with the *MTO Drainage Management Manual (1997)* Guidelines were completed. Table 6 presents the analysis findings.

Table 6 Outlet A Rip-Rap Sizing	
Bottom Shear Stress	71 N/m^2
Side Slope Shear Stress	29 N/m^2
Median Rip-Rap Size	150mm
Bottom Shear Resistance	94 N/m^2
Side Shear Resistance	53 N/m^2

Based on the shear stresses, and shear resistances presented above, it can be concluded that the existing 150mm final Outlet A rip-rap channel is adequately sized to prevent erosion during storm events up to and including the 100-year design storm event. Refer to the complete calculations in Appendix C.

Outlet B

Outlet B receives runoff from catchments B1, B2, B3, B4, B5 and B6 and consists of an existing 450mm diameter culvert which outlets to a 2.5m gravel access road, leading down to Lake Erie. Table 7 presents the maximum capacity of the 450mm diameter culvert and the 10-year and 100-year flow rate experienced at Outlet B.

Table 7 Outlet B Performance	
Maximum Culvert Capacity	0.69 m^3/s
10-Year Flow Rate	0.60 m^3/s
100-Year Flow Rate	1.14 m^3/s

As shown above, the existing culvert provides adequate capacity to convey the peak 10-year flow rate. When flow rates exceed the capacity of the culvert, stormwater runoff will flow overtop the culvert and flow overland to the gravel access road, and ultimately to Lake Erie as it does in pre-development conditions. Complete calculations and Visual OTTHYMO model output are detailed in Appendix C and D, respectively.

Conclusions and Recommendations

The stormwater management design for the proposed development can be summarized as follows:

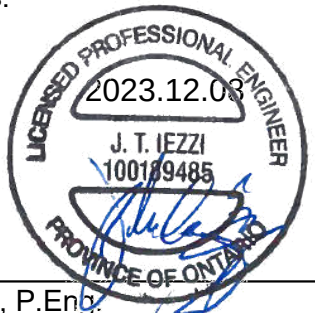
- There is no increase to the existing drainage catchment that currently outlets overland towards the ravine to the north, therefore there is no increase of erosion to the ravine embankment.
- An enhanced level of stormwater quality control is provided by a series of enhanced grass swales, prior to discharge releasing to Lake Erie.
- The peak flow rate, velocity, and flow depth in each treatment swale during the 4-hour, 25mm Chicago quality storm event has been reduced to less than 0.15 m^3/s, 0.5 m/s and 100mm, respectively.
- Each swale, including both outlet swales have been sized to adequately convey the 100-year storm event and convey the 10-year storm event at non-erosive velocities (less than 1 m/s).
- The existing rip-rap trench at Outlet A provides adequate capacity to convey the peak 10-year flow rate, and the 100-year storm event is adequately conveyed within the trench and road width.

- Prior to discharging to Lake Erie, the existing final rip-rap channel at Outlet A provides adequate capacity and erosion protection to convey the 100-year storm event safely.
- The existing 450mm diameter culvert at Outlet B provides adequate capacity to convey the peak 10-year flow rate, and when flow rates exceed the capacity of the culvert, stormwater runoff will flow overland to the gravel access road, and ultimately to Lake Erie as it does in pre-development conditions.

It is recommended that this report be provided to Norfolk County and the Long Point Region Conservation Authority in support of the site plan application for the proposed development.

We trust that this information is complete and sufficient for submission. Should you have any questions or require further information please do not hesitate to contact us.

Respectfully submitted,



Natalie Biesinger, B.A.Sc., EIT
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

John Iezzi, P.Eng.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects and Planners

Appendix A
– 10-094 FIG1 – Site Location Plan
– 10-094 FIG2 – Pre-Development SWM Drainage Areas
– 10-094 FIG3 – Post-Development SWM Drainage Areas

Appendix B
– Soil Information

Appendix C
– Catchment & Soil Parameters
– Impervious Area to Swale Area Ratio
– Quality Swales Capacity & Velocity
– Quantity Swales Capacity & Velocity
– Outlet Capacity
– Driveway Culvert Capacity
– Outlet A Rip-Rap Calculations

Appendix D
– Visual OTTHYMO Output Files

APPENDIX A

10-094 FIG1 – Site Location Plan
10-094 FIG2 – Pre-Development SWM Drainage Areas
10-094 FIG3 – Post-Development SWM Drainage Areas

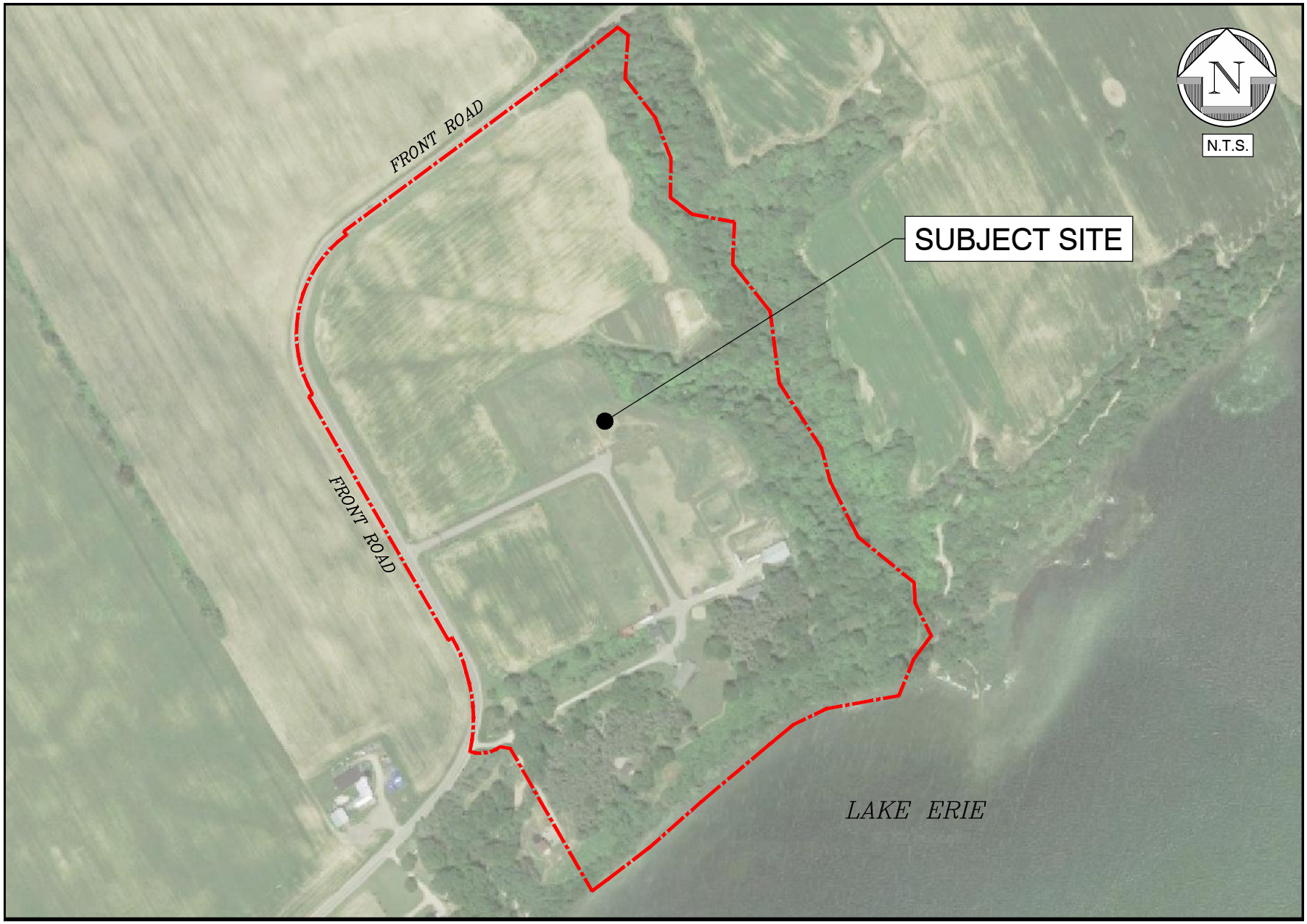
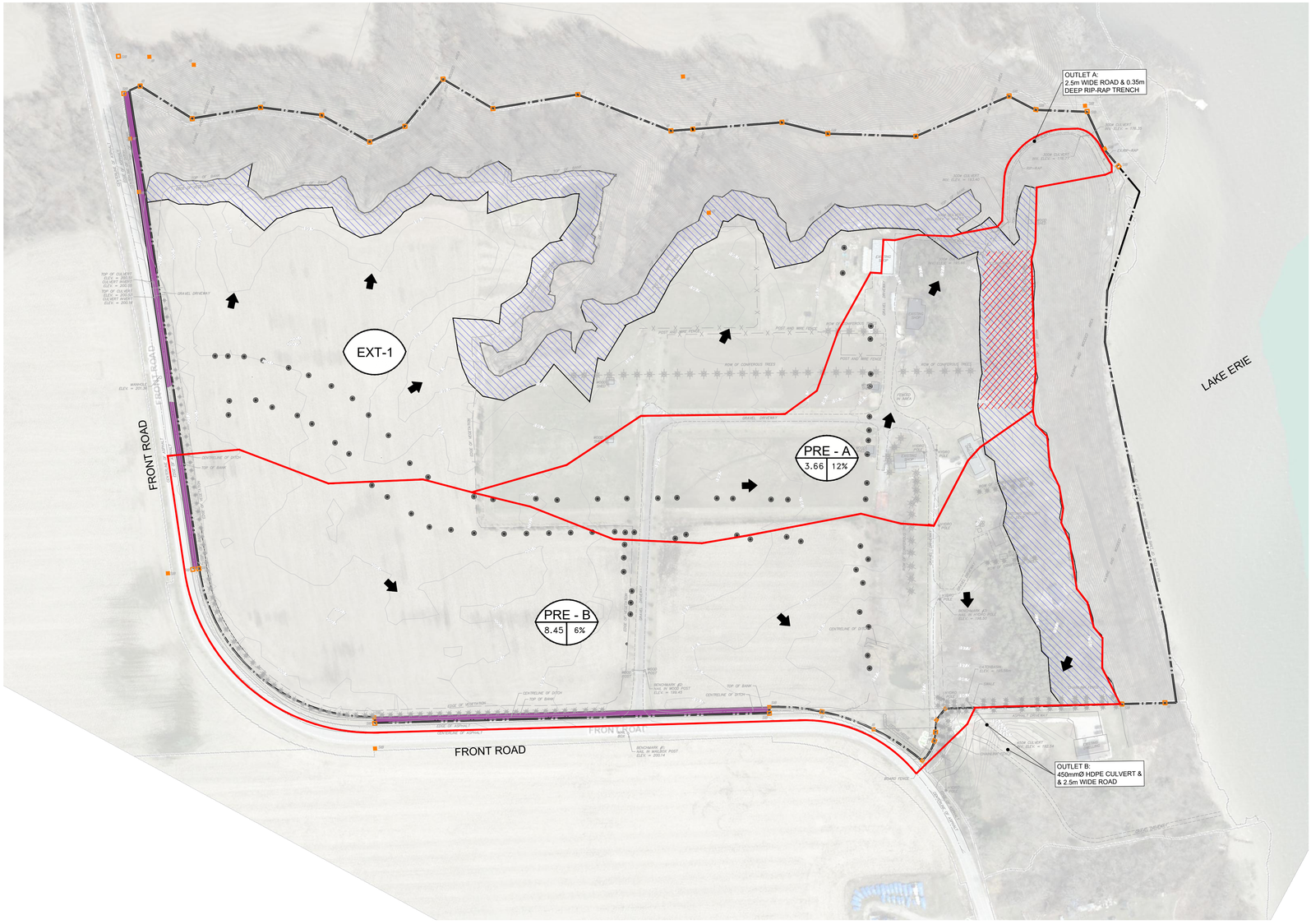


FIG 1 - SITE LOCATION PLAN



No.	DATE	ISSUED
0	12/05/2023	THIRD SUBMISSION TO COUNTY

No.	DATE	REVISION

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TOPOGRAPHICAL INFORMATION BY KIM HUSTED SURVEYING LTD, PLAN DATED DEC 2, 2021

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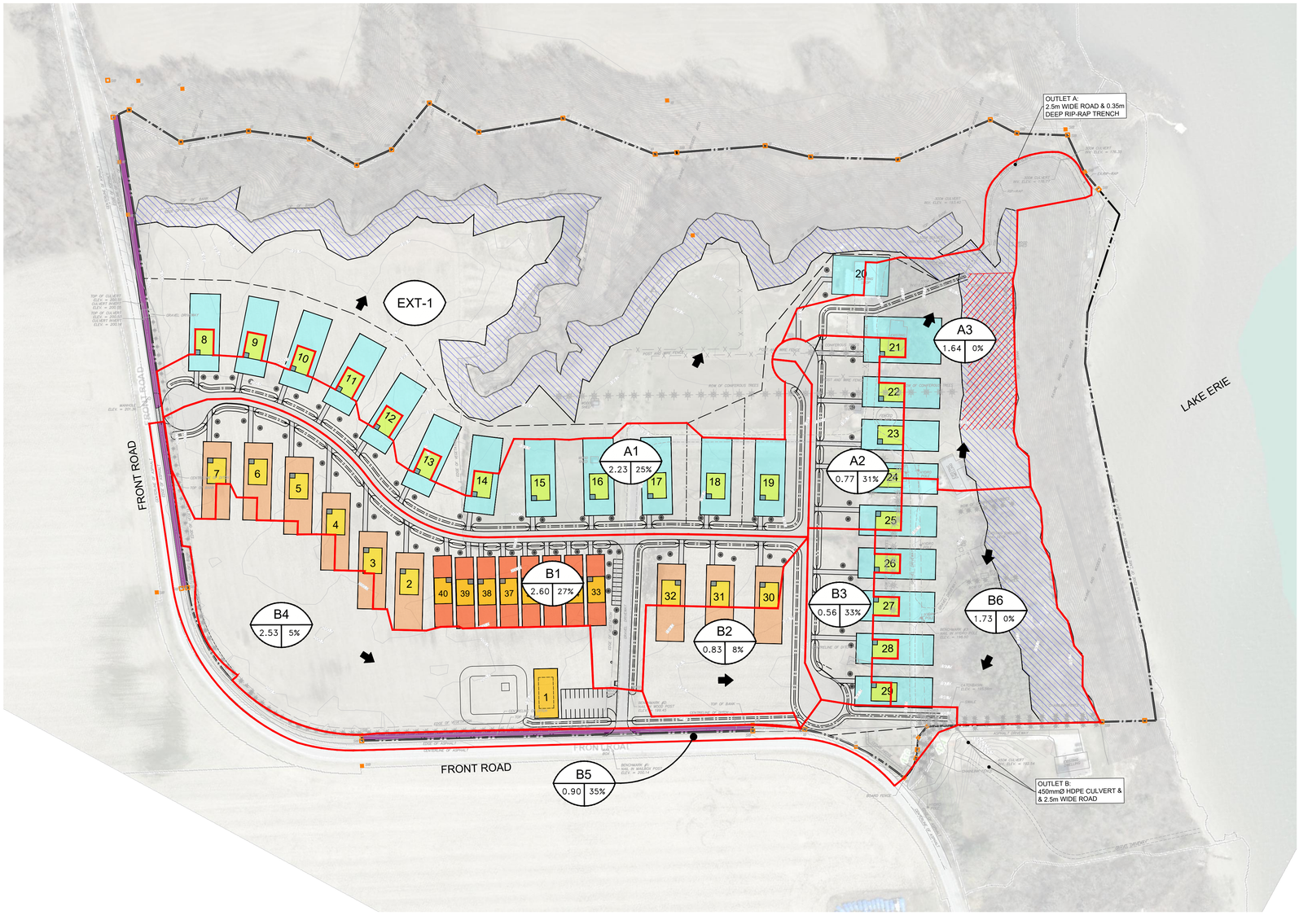
PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Project Title
BB RANCH
VACATION RESORT
ST. WILLIAMS - NORFOLK COUNTY

Drawing Title
PRE-DEVELOPMENT SWM DRAINAGE AREAS

Designed by : NLB	Drawn By : NBN
Checked by : JTI	Date Started : JANUARY 2022
Drawing Scale : 1:1000	Drawing No. FIG2
Project No. 10-094	

DATE LAST PLOTTED : December 5, 2023



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(519) 426-6270

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PRELIMINARY
NOT TO BE USED
FOR CONSTRUCTION

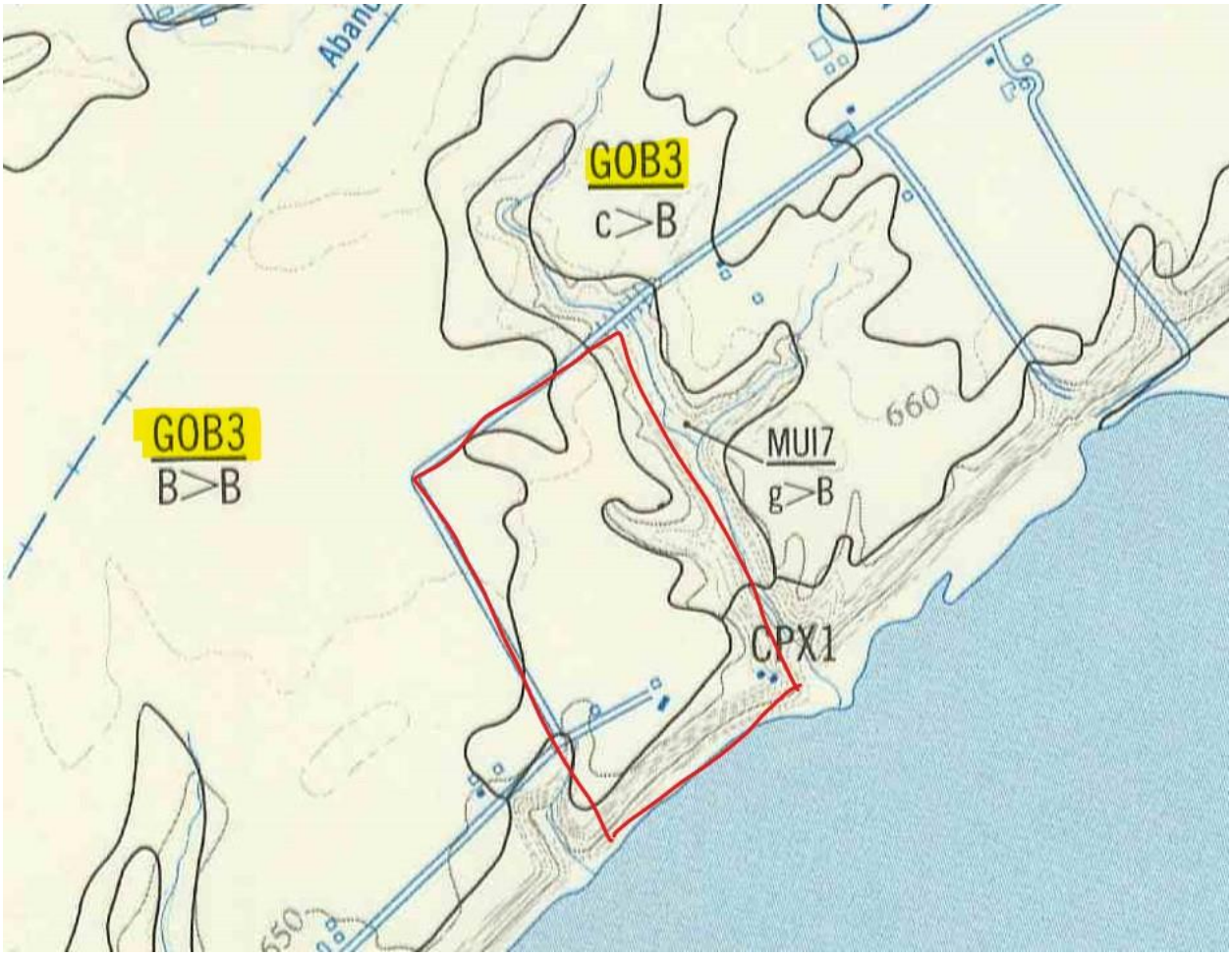
Project Title
BB RANCH
VACATION RESORT
ST. WILLIAMS - NORFOLK COUNTY

Drawing Title
POST-DEVELOPMENT SWM DRAINAGE AREAS

Designed by : NLB	Drawn By : NBN
Checked by : JTI	Date Started : JANUARY 2022
Drawing Scale : 1:1000	Drawing No. FIG3
Project No. 10-094	

DATE LAST PLOTTED : December 5, 2023

APPENDIX B
Soil Information



GOB - Gobles						
GOB 1	GOB	None	Mainly silty clay loam till		Imperfect	
GOB 3	GOB	KVN	see GOB 1	see KVN 1	Imperfect	Poor
GOB 14	GOB	BRR.T	see GOB 1	see BRR 2	Imperfect	Imperfect

CHART C2-2 - HYDROLOGIC SOIL GROUPS FOR GENERAL SOIL TYPES

Sands, sandy loams, and gravels	
- overlying sand, gravel or limestone bedrock, very well drained	A
- ditto, imperfectly drained	AB
- Shallow, overlying precambrian bedrock or clay subsoil	B
Coarse loams	
- overlying sand, gravel or limestone, well drained	AB
- shallow, overlying precambrian bedrock or clay subsoil	B
Medium textured loams	
- shallow, overlying limestone bedrock	B
- overlying medium textured subsoil	BC
Silt loams, some loams	
- with good internal drainage	BC
- with slow internal drainage and good external drainage	C
Clays, clay loams, silty clay loams	
- with good internal drainage	C
- with imperfect or poor external drainage	C
- with slow internal drainage and good external drainage	D

Note: Soils are classified on the basis of bare soil having maximum swelling at the end of a long storm whose rainfall exceeds infiltration into soil. Classifications shown are subject to modification as experience dictates.

Classifications are based on S.C.S. definitions (9) modified to suit Ontario conditions.

Land Use	Hydrologic Soil Group						
	A	AB	B	BC	C	CD	D
Fallow (special cases only)	77	82	86	89	91	93	94
Crop and other improved land	66*	70	74	78	82	84	86
Pasture & other unimproved land	58*	62*	65	71	76	79	81
Woodlots and forest	50*	54*	58	65	71	74	77
Impervious areas (paved)		98					
Bare rock draining directly to stream		98					
Bare rock draining indirectly to stream		70					
Water surfaces		100 (use in special cases only)					

Notes

1. Figures are based on average antecedent moisture condition (AMC II) except those marked *, which are initially wet (AMC III) or an intermediate condition. For definition of AMC's see Chart C2-10.
2. Table is not applicable to frozen soils or to periods in which snowmelt contributes to runoff.
3. For detailed values in urban areas see Table 2.2 of ref. 14.
4. Source: SCS Handbook of Hydrology, Chapter 9 (9), with modifications.

APPENDIX C

Catchment & Soil Parameters
Impervious Area to Swale Area Ratio
Quality Swales Capacity & Velocity
Quantity Swales Capacity & Velocity
Outlet Capacity
Driveway Culvert Capacity
Outlet A Rip-Rap Calculations

vallee
Consulting Engineers, Architects & Planners

Subject:	Catchment & Soil Parameters		
Date:	10/30/2023	By:	NLB
Project #:	10-094	Page	1

Post-Development Catchment Parameters

Drainage Area	Area Description	Area (ha)	Imperv. Area (ha)	TIMP (%)	Runoff Coeff.	Time of Conc. (min)	Time to Peak (hr)
		(1)	(2)	(2)/(1)			
PRE-A	Pre-Dev to Outlet A	3.66	0.43	12%	0.33	47.15	0.47
PRE-B	Pre-Dev to Outlet B	8.45	0.47	6%	0.29	54.77	0.55

Post-Development Impervious Area Totals

Impervious Area Description	Impervious Area (m2)								
	A1 (Units 8-19)	A2 (Units 21-25)	A3	B1 (Units 2-7 & 30-40)	B2	B3 (Units 26-29)	B4	B5	B6
Tourist Cabins				1536					
Large House	2676	1115		2007		892			
Driveways	386	446		798		308			
Roads	2592	838		2660	653	625	190	3189	
Parking							659		
Pavillion							498		
Total Impervious (m2)	5654	2399	0	7001	653	1825	1347	3189	0
Total Impervious (ha)	0.57	0.24	0.00	0.70	0.07	0.18	0.13	0.32	0.00

Post-Development Catchment Parameters

Drainage Area	Area Description	Area (ha)	Imperv. Area (ha)	TIMP (%)	Runoff Coeff.	Time of Conc. (min)	Time to Peak (hr)
		(1)	(2)	(2)/(1)			
A1	Units 8-19	2.23	0.57	25%	N/A		
A2	Units 21-25	0.77	0.24	31%	N/A		
A3		1.64	0.00	0%	0.25	26.55	0.27
B1	Units 2-7 & 30-40	2.60	0.70	27%	N/A		
B2		0.83	0.07	8%	0.30	22.78	0.23
B3	Units 26-29	0.56	0.18	33%	N/A		
B4		2.53	0.13	5%	0.28	43.57	0.44
B5		0.90	0.32	35%	N/A		
B6		1.73	0.00	0%	0.25	41.10	0.41

$$C = 0.9\ (\%\ imperv) + 0.25\ (1 - \%\ Imperv)$$

$$\%\ Imperv = \frac{C - 0.25}{0.65} \times 100$$

Airport Formula

Tc = 3.26 * (1.1 - C) * L^0.5 /Sw^0.33

Tc = Time of Concentration (minutes)
C = Runoff Coefficient (dimensionless)
L = Watershed Length (metres)
Sw = Watershed Slope % (m/m)

Soil Parameters

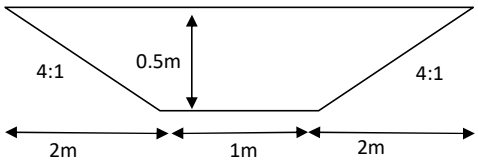
Soil Type	C - mainly silty clay loam till with imperfect drainage		
CN (-)	82		
Ia Developed	4.2	mm	
Infiltration Rate (i)	12	mm/hr	*Geotechnical Investigation*
Estimated Percolation Time	50	min/cm	*(Peto MacCallum Ltd, April 26, 2022)*
Safety Factor	2.5		
Design Infiltration Rate (i)	4.8	mm/hr	
Drawdown Time	24	hr	
Ponding Depth	115	mm	

Impervious Area to Swale Area Ratios

Drainage Area	Imperv. Area (m2)	Swale Length (m)	Swale Width (m)	Swale Footprint Area (m2)	Imperv. Area to Swale Area Ratio (#:1)	Check <10:1
A1	5654	418	5.0	2089	2.7	✓
A2	2399	67	5.0	335	7.2	✓
B1 + B2	7654	420	5.0	2101	3.6	✓
B3	1825	76	5.0	380	4.8	✓
B4	1347	157	5.0	785	1.7	✓

Swale Flow Rates

Swale #	Flow Rate to Swale (m3/s)		
	25mm	10-YR	100-YR
A1	0.035	0.215	0.441
A2	0.014	0.085	0.162
B1 + B2	0.056	0.311	0.612
B3	0.013	0.067	0.124
B4	0.032	0.125	0.222



$$Q = \frac{1}{n} A \left(\frac{A}{P}\right)^{\frac{2}{3}} \sqrt{S}$$

V=Q/A

A1	Maximum Capacity	25mm	10-YR	100-YR
Bottom Width (m)	1	1	1	1
Depth (m)	**0.500**	**0.067**	**0.178**	**0.255**
Side Slopes (#:1)	4	4	4	4
Area (m2)	1.50	0.08	0.31	0.52
Wetted Perimeter (m)	5.12	1.55	2.47	3.11
Hydraulic Radius (m)	0.293	0.055	0.124	0.166
Slope (%)	0.50	0.50	0.50	0.50
Manning Coeff. (Short Grass)	0.025	0.025	0.025	0.025
Flow, Q (m3/s)	**1.871**	✓ **0.035**	✓ **0.215**	✓ **0.441**
Velocity, V (m/s)	**1.25**	✓ **0.41**	✓ **0.70**	✓ **0.85**

A2	Maximum Capacity	25mm	10-YR	100-YR
Bottom Width (m)	1	1	1	1
Depth (m)	**0.500**	**0.039**	**0.107**	**0.151**
Side Slopes (#:1)	4	4	4	4
Area (m2)	1.50	0.05	0.15	0.24
Wetted Perimeter (m)	5.12	1.32	1.88	2.24
Hydraulic Radius (m)	0.293	0.034	0.081	0.108
Slope (%)	0.55	0.55	0.55	0.55
Manning Coeff. (Short Grass)	0.025	0.025	0.025	0.025
Flow, Q (m3/s)	**1.962**	✓ **0.014**	✓ **0.085**	✓ **0.162**
Velocity, V (ms)	**1.31**	✓ **0.31**	✓ **0.56**	✓ **0.67**

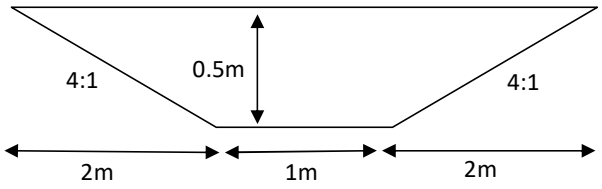
B1 + B2	Maximum Capacity	25mm	10-YR	100-YR
Bottom Width (m)	1	1	1	1
Depth (m)	**0.500**	**0.088**	**0.215**	**0.299**
Side Slopes (#:1)	4	4	4	4
Area (m2)	1.50	0.12	0.40	0.66
Wetted Perimeter (m)	5.12	1.72	2.77	3.46
Hydraulic Radius (m)	0.293	0.069	0.144	0.189
Slope (%)	0.50	0.50	0.50	0.50
Manning Coeff. (Short Grass)	0.025	0.025	0.025	0.025
Flow, Q (m3/s)	**1.871**	✓ **0.056**	✓ **0.311**	✓ **0.612**
Velocity, V (ms)	**1.25**	✓ **0.47**	✓ **0.78**	✓ **0.93**

B3	Maximum Capacity	25mm	10-YR	100-YR
Bottom Width (m)	1	1	1	1
Depth (m)	**0.500**	**0.038**	**0.094**	**0.131**
Side Slopes (#:1)	4	4	4	4
Area (m2)	1.50	0.04	0.13	0.20
Wetted Perimeter (m)	5.12	1.31	1.78	2.08
Hydraulic Radius (m)	0.293	0.033	0.073	0.096
Slope (%)	0.55	0.55	0.55	0.55
Manning Coeff. (Short Grass)	0.025	0.025	0.025	0.025
Flow, Q (m3/s)	**1.962**	✓ **0.013**	✓ **0.067**	✓ **0.124**
Velocity, V (ms)	**1.31**	✓ **0.31**	✓ **0.52**	✓ **0.62**

B4	Maximum Capacity	25mm	10-YR	100-YR
Bottom Width (m)	1	1	1	1
Depth (m)	**0.500**	**0.031**	**0.112**	**0.152**
Side Slopes (#:1)	4	4	4	4
Area (m2)	1.50	0.03	0.16	0.24
Wetted Perimeter (m)	5.12	1.26	1.92	2.25
Hydraulic Radius (m)	0.293	0.028	0.084	0.108
Slope (%)	1.00	1	1	1
Manning Coeff. (Short Grass)	0.025	0.025	0.025	0.025
Flow, Q (m3/s)	**2.646**	✓ **0.013**	✓ **0.125**	✓ **0.222**
Velocity, V (ms)	**1.76**	✓ **0.37**	✓ **0.77**	✓ **0.91**

Swale Flow Rates

Swale #	Flow Rate to Swale (m3/s)	
	10-YR	100-YR
A1 + A2 + A3	0.380	0.754
B1 + B2 + B3 + B4 + B5	0.543	1.058



A1 + A2 + A3	Maximum Capacity	10-YR	100-YR
Bottom Width (m)	1	1	1
Depth (m)	**0.500**	**0.314**	**0.432**
Side Slopes (#:1)	4	4	4
Area (m2)	1.50	0.71	1.18
Wetted Perimeter (m)	5.12	3.59	4.56
Hydraulic Radius (m)	0.293	0.197	0.258
Slope (%)	0.90	0.90	0.90
Manning Coeff. (Unmaintained)	0.060	0.060	0.060
Flow, Q (m3/s)	**1.046**	✓ **0.380**	✓ **0.754**
Velocity, V (m/s)	**0.70**	✓ **0.54**	✓ **0.64**

B1 + B2 + B3 + B4 + B3	Maximum Capacity	10-YR	100-YR
Bottom Width (m)	1	1	1
Depth (m)	**0.500**	**0.312**	**0.425**
Side Slopes (#:1)	4	4	4
Area (m2)	1.50	0.70	1.15
Wetted Perimeter (m)	5.12	3.57	4.50
Hydraulic Radius (m)	0.293	0.196	0.255
Slope (%)	1.90	1.90	1.90
Manning Coeff. (Unmaintained)	0.060	0.060	0.060
Flow, Q (m3/s)	**1.519**	✓ **0.543**	✓ **1.058**
Velocity, V (m/s)	**1.01**	✓ **0.78**	✓ **0.92**

$$Q = \frac{1}{n} A \left(\frac{A}{P} \right)^{\frac{2}{3}} \sqrt{S}$$

V=Q/A

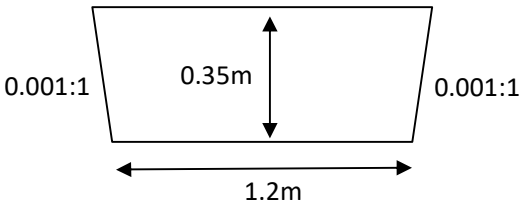
Total Outlet Flow Rates

Outlet	Flow Rate to Outlet (m3/s)	
	10-YR	100-YR
A1 + A2 + A3	0.380	0.754
B1 + B2 + B3 + B4 + B5 + B6	0.601	1.142

$$Q = \frac{1}{n} A \left(\frac{A}{P} \right)^{\frac{2}{3}} \sqrt{S}$$

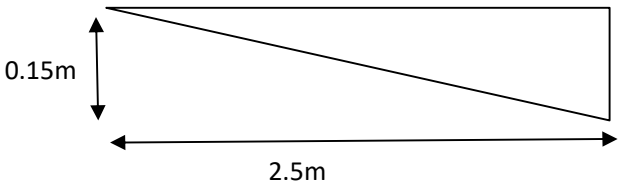
OUTLET A

A1 + A2 + A3 STONE TRENCH	Maximum Capacity		10-YR
Bottom Width (m)	1.2		1.2
Depth (m)	**0.350**		**0.335**
Side Slopes (#:1)	0.001		0.001
Area (m2) * 0.4 void ratio	0.17		0.16
Wetted Perimeter (m)	1.90		1.87
Hydraulic Radius (m)	0.088		0.086
Slope (%)	18.0		18.0
Manning Coeff. (Rip-Rap)	0.035		0.035
Flow, Q (m3/s)	**0.404**	✓	**0.380**
Velocity, V (m/s)	**2.41**		**2.36**



REMAINING FLOW TO CONVEY IN ROAD WIDTH:
100-YR Flow to Outlet A - Maximum Stone Trench Capacity = **0.350 m3/s**

A1 + A2 + A3 ROAD WIDTH	Maximum Capacity		100-YR - Road Conveyance
Road Width (m)	2.5		2.5
Depth (m)	**0.150**		**0.134**
Side Slopes (#:1)	16.7		16.7
Area (m2)	0.19		0.15
Wetted Perimeter (m)	2.51		2.24
Hydraulic Radius (m)	0.075		0.067
Slope (%)	18.0		18.0
Manning Coeff. (Gravel)	0.030		0.030
Flow, Q (m3/s)	**0.472**	✓	**0.350**
Velocity, V (m/s)	**2.51**		**2.33**



OUTLET B

450mm DIA. CULVERT	Maximum Capacity		10-YR		100-YR
Pipe Diameter (mm)	450				
Area (m2)	0.16				
Wetted Perimeter (m)	1.41				
Hydraulic Radius (m)	0.113				
Slope (%)	5.80				
Manning Coeff. (HDPE)	0.013				
Flow, Q (m3/s)	**0.687**	✓	**0.601**	✗	**1.142**

REMAINING FLOW TO CONVEY OVERLAND:
100-YR Flow to Outlet B - Maximum 450mm Culvert Capacity = **0.455 m3/s**

Swale Flow Rates

Swale #	Flow Rate to Swale (m3/s)
	10-YR
A1	0.215
A2	0.085
B1	0.250
B3	0.067

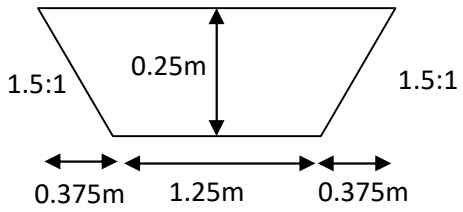
Driveway Culvert	**Maximum Capacity**
Size (mm)	450
Area (m2)	0.16
Wetted Perimeter (m)	1.41
Hydraulic Radius (m)	0.113
Slope (%)	1.50
Manning Coeff.	0.013
Flow, Q (m3/s)	**0.349**

$$Q = \frac{1}{n} A \left(\frac{A}{P} \right)^{\frac{2}{3}} \sqrt{S}$$

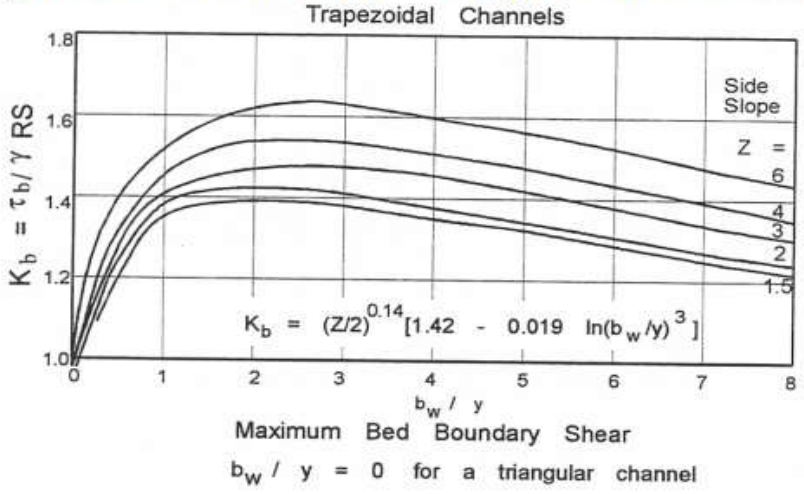
> 10-YR Peak Flows ✓

Final Outlet A Rip-Rap Calculations

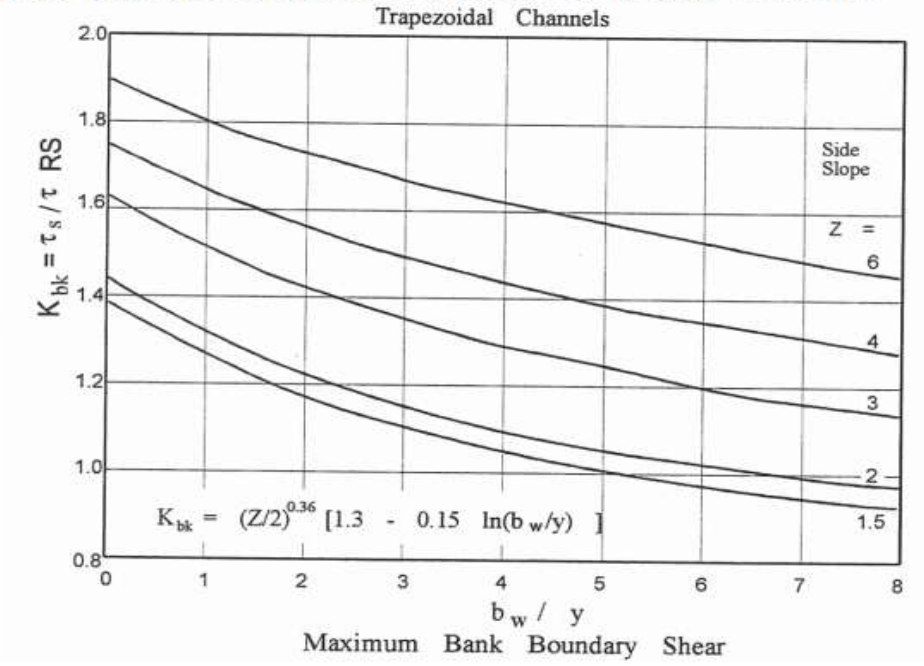
10-Year Peak Flow	**0.380**	**m3/s**	
100-Year Peak Flow	**0.754**	**m3/s**	
Bottom Width (bw)	1.25	m	top width = 2.00 m
Depth (y)	0.250	m	
bw/y	5.0		
Side Slopes (Z)	1.5	:1	
Cross-Sectional Area of Flow	0.41	m2	
Wetted Perimeter	2.15	m	
Hydraulic Radius	0.19	m	
Slope	0.03	m/m	
Manning's n (Rip-Rap)	0.03		
100-Year Peak Flow	**0.772**	**m3/s**	
Velocity	**1.90**	**m/s**	
Mean Boundary Shear Stress (τ_o)	55.57	N/m2	
Kbottom	1.28		MTO Design Chart 2.11
Shear Bottom (τ_b)	**71**	**N/m2**	
Kbank	0.52		MTO Design Chart 2.12
Shear Bank Sides (τ_s)	**29**	**N/m2**	
D50 (Median Particle Size)	150	mm	
Convert to kg to N	1471.5	N	
Shear Stress Resistance Bottom (τ_{cb})	**94**	**N/m2**	
Resitance Bottom > Shear Bottom?	**OK**		
Side Slope/Bank Angle (θ)	34	degrees	
Angle of Repose (ϕ)	42	degrees	MTO Design Chart 2.13
Kcs (channel sides)	0.56		θ must be < ϕ for calculation to work
Shear Stress Resistance Channel Sides (τ_{cs})	**53**	**N/m2**	
Resitance Sides > Shear Sides?	**OK**		



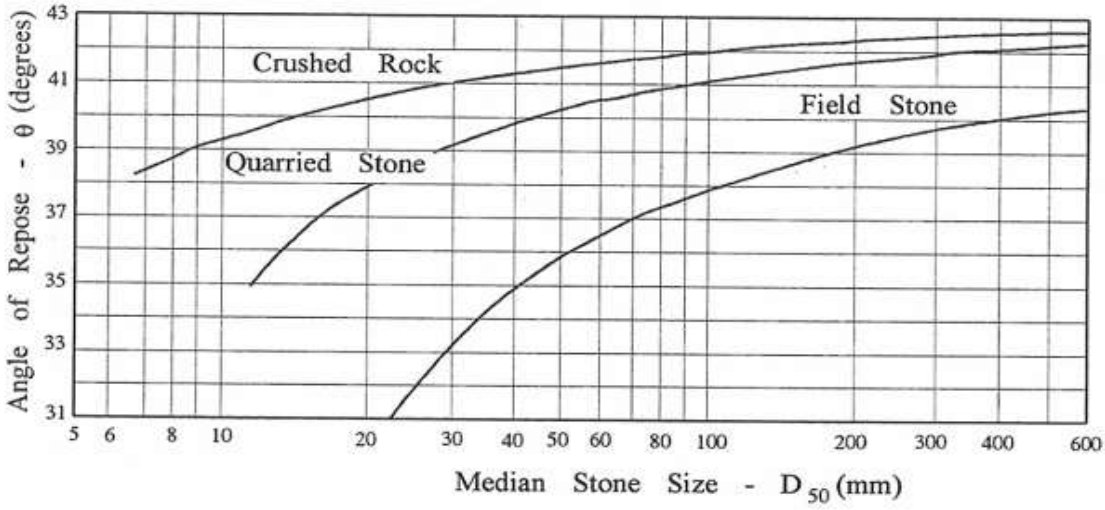
Design Chart 2.11: Coefficients of Boundary Shear on Channel Bed



Design Chart 2.12: Coefficients of Boundary Shear on the Side Slope



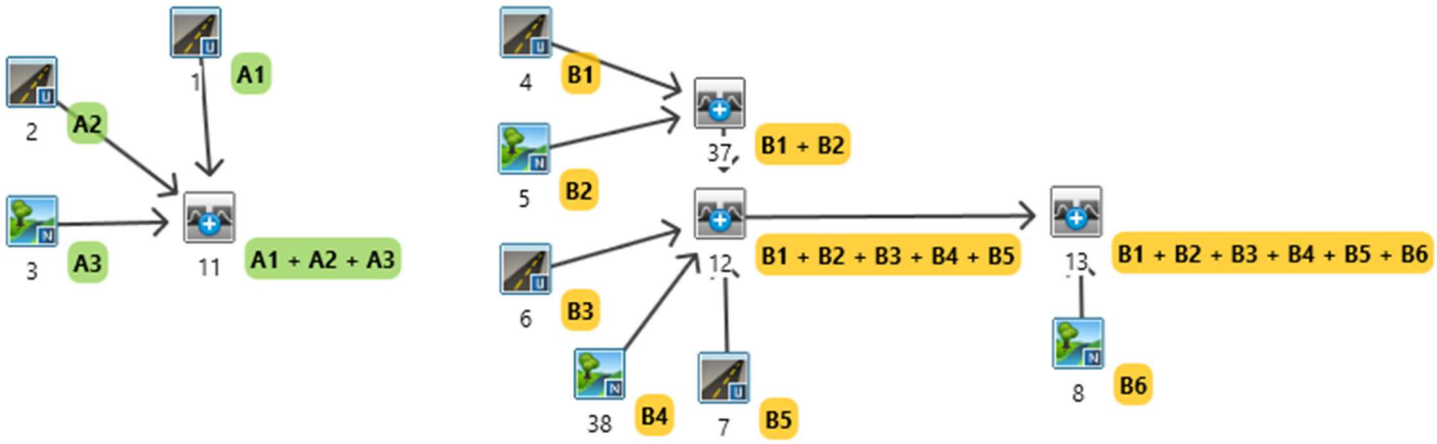
Design Chart 2.13: Determining Angle of Repose



APPENDIX D

Visual OTTHYMO Output Files

10-094 BB Ranch
Visual OTTHYMO MODEL



4-Hour, 25mm Chicago Storm Event

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        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M M M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****

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DATE: 12/05/2023                          TIME: 10:01:01

USER:


COMMENTS: _____________________________________________________

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  ***********************************************
  ** SIMULATION : 25 mm, 4 hr Norfolk          **
  ***********************************************


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|    READ STORM    |    Filename: C:\Users\Natalie\AppD
|                  |              ata\Local\Temp\
|                  |              fe8b8a41-02ac-4897-96f8-dfafe98f563d\c887d201
| Ptotal= 25.00 mm |    Comments: 25 mm, 4 hr Norfolk
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    0.00 |  1.17   12.56 |  2.33    3.61 |  3.50    1.96
                0.17    1.90 |  1.33   51.29 |  2.50    3.19 |  3.67    1.85
                0.33    2.16 |  1.50   16.17 |  2.67    2.87 |  3.83    1.75
                0.50    2.51 |  1.67    8.96 |  2.83    2.61 |  4.00    1.67
                0.67    3.03 |  1.83    6.38 |  3.00    2.41 |
                0.83    3.90 |  2.00    5.03 |  3.17    2.23 |
                1.00    5.69 |  2.17    4.19 |  3.33    2.09 |

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| CALIB            |
| NASHYD   (  0003)|   Area     (ha)=   1.64   Curve Number    (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   4.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.27

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.00 | 1.167    5.69 | 2.250    4.19 |  3.33    2.23
               0.167    0.00 | 1.250   12.56 | 2.333    4.19 |  3.42    2.09
               0.250    1.90 | 1.333   12.56 | 2.417    3.61 |  3.50    2.09
               0.333    1.90 | 1.417   51.29 | 2.500    3.61 |  3.58    1.96
               0.417    2.16 | 1.500   51.29 | 2.583    3.19 |  3.67    1.96
               0.500    2.16 | 1.583   16.17 | 2.667    3.19 |  3.75    1.85
               0.583    2.51 | 1.667   16.17 | 2.750    2.87 |  3.83    1.85
               0.667    2.51 | 1.750    8.96 | 2.833    2.87 |  3.92    1.75
               0.750    3.03 | 1.833    8.96 | 2.917    2.61 |  4.00    1.75
               0.833    3.03 | 1.917    6.38 | 3.000    2.61 |  4.08    1.67
               0.917    3.89 | 2.000    6.38 | 3.083    2.41 |  4.17    1.67
               1.000    3.90 | 2.083    5.03 | 3.167    2.41 |
               1.083    5.69 | 2.167    5.03 | 3.250    2.23 |

     Unit Hyd Qpeak  (cms)=   0.232

     PEAK FLOW       (cms)=   0.020 (i)
     TIME TO PEAK    (hrs)=   1.833
     RUNOFF VOLUME    (mm)=   5.647
     TOTAL RAINFALL   (mm)=  24.999
     RUNOFF COEFFICIENT   =   0.226

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  0001)|   Area     (ha)=   2.23
|ID= 1 DT= 5.0 min |   Total Imp(%)=  27.00   Dir. Conn.(%)=   0.00
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                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.60          1.63
     Dep. Storage     (mm)=       1.00          4.20
     Average Slope     (%)=       1.00          2.00
     Length            (m)=     121.93         40.00
     Mannings n           =      0.013         0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.00 | 1.167    5.69 | 2.250    4.19 |  3.33    2.23
               0.167    0.00 | 1.250   12.56 | 2.333    4.19 |  3.42    2.09
               0.250    1.90 | 1.333   12.56 | 2.417    3.61 |  3.50    2.09
               0.333    1.90 | 1.417   51.29 | 2.500    3.61 |  3.58    1.96
               0.417    2.16 | 1.500   51.29 | 2.583    3.19 |  3.67    1.96
               0.500    2.16 | 1.583   16.17 | 2.667    3.19 |  3.75    1.85
               0.583    2.51 | 1.667   16.17 | 2.750    2.87 |  3.83    1.85
               0.667    2.51 | 1.750    8.96 | 2.833    2.87 |  3.92    1.75
               0.750    3.03 | 1.833    8.96 | 2.917    2.61 |  4.00    1.75
               0.833    3.03 | 1.917    6.38 | 3.000    2.61 |  4.08    1.67
               0.917    3.89 | 2.000    6.38 | 3.083    2.41 |  4.17    1.67
               1.000    3.90 | 2.083    5.03 | 3.167    2.41 |
               1.083    5.69 | 2.167    5.03 | 3.250    2.23 |

     Max.Eff.Inten.(mm/hr)=      51.29         13.29
               over (min)        5.00         20.00
     Storage Coeff.  (min)=      3.76 (ii)    19.58 (ii)
     Unit Hyd. Tpeak (min)=      5.00         20.00
     Unit Hyd. peak  (cms)=      0.27          0.06
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.00          0.03      0.035 (iii)
     TIME TO PEAK    (hrs)=      1.50          1.75       1.75
     RUNOFF VOLUME    (mm)=     24.00          7.68       7.68
     TOTAL RAINFALL   (mm)=     25.00         25.00      25.00
     RUNOFF COEFFICIENT   =      0.96          0.31       0.31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  82.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  0002)|   Area     (ha)=   0.77
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Visual OTTHYMO MODEL

|ID= 1 DT= 5.0 min | Total Imp(%)= 31.00 Dir. Conn.(%)= 0.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.24	0.53
Dep. Storage	(mm)=	1.00	4.20
Average Slope	(%)=	1.00	2.00
Length	(m)=	71.65	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	5.69	2.250	4.19	3.33	2.23
0.167	0.00	1.250	12.56	2.333	4.19	3.42	2.09
0.250	1.90	1.333	12.56	2.417	3.61	3.50	2.09
0.333	1.90	1.417	51.29	2.500	3.61	3.58	1.96
0.417	2.16	1.500	51.29	2.583	3.19	3.67	1.96
0.500	2.16	1.583	16.17	2.667	3.19	3.75	1.85
0.583	2.51	1.667	16.17	2.750	2.87	3.83	1.85
0.667	2.51	1.750	8.96	2.833	2.87	3.92	1.75
0.750	3.03	1.833	8.96	2.917	2.61	4.00	1.75
0.833	3.03	1.917	6.38	3.000	2.61	4.08	1.67
0.917	3.89	2.000	6.38	3.083	2.41	4.17	1.67
1.000	3.90	2.083	5.03	3.167	2.41		
1.083	5.69	2.167	5.03	3.250	2.23		

				TOTALS
Max.Eff.Inten.(mm/hr)=		51.29	16.43	
over (min)		5.00	20.00	
Storage Coeff. (min)=		2.73 (ii)	17.27 (ii)	
Unit Hyd. Tpeak (min)=		5.00	20.00	
Unit Hyd. peak (cms)=		0.29	0.06	
PEAK FLOW	(cms)=	0.00	0.01	0.014 (iii)
TIME TO PEAK	(hrs)=	1.50	1.75	1.75
RUNOFF VOLUME	(mm)=	24.00	8.06	8.05
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	0.96	0.32	0.32

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0010)			AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3			(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):		2.23	0.035	1.75	7.68
+	ID2= 2 (0002):		0.77	0.014	1.75	8.05
	ID = 3 (0010):		3.00	0.049	1.75	7.77

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0010)			AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1			(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (0010):		3.00	0.049	1.75	7.77
+	ID2= 2 (0003):		1.64	0.020	1.83	5.65
	ID = 1 (0010):		4.64	0.068	1.75	7.02

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
NASHYD (0009)|	Area	(ha)=	1.73	Curve Number	(CN)= 82.0
ID= 1 DT= 5.0 min |	Ia	(mm)=	4.20	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)=		0.41		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	5.69	2.250	4.19	3.33	2.23
0.167	0.00	1.250	12.56	2.333	4.19	3.42	2.09
0.250	1.90	1.333	12.56	2.417	3.61	3.50	2.09
0.333	1.90	1.417	51.29	2.500	3.61	3.58	1.96
0.417	2.16	1.500	51.29	2.583	3.19	3.67	1.96
0.500	2.16	1.583	16.17	2.667	3.19	3.75	1.85
0.583	2.51	1.667	16.17	2.750	2.87	3.83	1.85
0.667	2.51	1.750	8.96	2.833	2.87	3.92	1.75
0.750	3.03	1.833	8.96	2.917	2.61	4.00	1.75
0.833	3.03	1.917	6.38	3.000	2.61	4.08	1.67
0.917	3.89	2.000	6.38	3.083	2.41	4.17	1.67
1.000	3.90	2.083	5.03	3.167	2.41		
1.083	5.69	2.167	5.03	3.250	2.23		

Unit Hyd Qpeak (cms)= 0.161

PEAK FLOW (cms)= 0.016 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 5.650
TOTAL RAINFALL (mm)= 24.999
RUNOFF COEFFICIENT = 0.226

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0005)|	Area	(ha)=	0.83	Curve Number	(CN)= 82.0
ID= 1 DT= 5.0 min |	Ia	(mm)=	1.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)=		0.23		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	5.69	2.250	4.19	3.33	2.23
0.167	0.00	1.250	12.56	2.333	4.19	3.42	2.09
0.250	1.90	1.333	12.56	2.417	3.61	3.50	2.09
0.333	1.90	1.417	51.29	2.500	3.61	3.58	1.96
0.417	2.16	1.500	51.29	2.583	3.19	3.67	1.96
0.500	2.16	1.583	16.17	2.667	3.19	3.75	1.85
0.583	2.51	1.667	16.17	2.750	2.87	3.83	1.85
0.667	2.51	1.750	8.96	2.833	2.87	3.92	1.75
0.750	3.03	1.833	8.96	2.917	2.61	4.00	1.75
0.833	3.03	1.917	6.38	3.000	2.61	4.08	1.67
0.917	3.89	2.000	6.38	3.083	2.41	4.17	1.67
1.000	3.90	2.083	5.03	3.167	2.41		
1.083	5.69	2.167	5.03	3.250	2.23		

Unit Hyd Qpeak (cms)= 0.138

PEAK FLOW (cms)= 0.015 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 7.213
TOTAL RAINFALL (mm)= 24.999
RUNOFF COEFFICIENT = 0.289

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0004)|	Area	(ha)=	2.60		
ID= 1 DT= 5.0 min |	Total Imp(%)=		27.00	Dir. Conn.(%)=	0.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.70	1.90
Dep. Storage	(mm)=	1.00	4.20
Average Slope	(%)=	1.00	2.00
Length	(m)=	131.66	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	5.69	2.250	4.19	3.33	2.23
0.167	0.00	1.250	12.56	2.333	4.19	3.42	2.09
0.250	1.90	1.333	12.56	2.417	3.61	3.50	2.09
0.333	1.90	1.417	51.29	2.500	3.61	3.58	1.96
0.417	2.16	1.500	51.29	2.583	3.19	3.67	1.96
0.500	2.16	1.583	16.17	2.667	3.19	3.75	1.85
0.583	2.51	1.667	16.17	2.750	2.87	3.83	1.85
0.667	2.51	1.750	8.96	2.833	2.87	3.92	1.75
0.750	3.03	1.833	8.96	2.917	2.61	4.00	1.75
0.833	3.03	1.917	6.38	3.000	2.61	4.08	1.67
0.917	3.89	2.000	6.38	3.083	2.41	4.17	1.67
1.000	3.90	2.083	5.03	3.167	2.41		
1.083	5.69	2.167	5.03	3.250	2.23		

				TOTALS
Max.Eff.Inten.(mm/hr)=		51.29	13.29	
over (min)		5.00	20.00	
Storage Coeff. (min)=		3.94 (ii)	19.76 (ii)	
Unit Hyd. Tpeak (min)=		5.00	20.00	
Unit Hyd. peak (cms)=		0.27	0.06	
PEAK FLOW	(cms)=	0.00	0.04	0.041 (iii)
TIME TO PEAK	(hrs)=	1.50	1.75	1.75
RUNOFF VOLUME	(mm)=	24.00	7.68	7.68
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	0.96	0.31	0.31

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011)			AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3			(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0004):		2.60	0.041	1.75	7.68
+	ID2= 2 (0005):		0.83	0.015	1.75	7.21
	ID = 3 (0011):		3.43	0.056	1.75	7.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
NASHYD (0007)|	Area	(ha)=	2.53	Curve Number	(CN)= 82.0
ID= 1 DT= 5.0 min |	Ia	(mm)=	1.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)=		0.44		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN

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Visual OTTHYMO MODEL

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	0.00	1.167	5.69	2.250	4.19	3.33	2.23
0.167	0.00	1.250	12.56	2.333	4.19	3.42	2.09
0.250	1.90	1.333	12.56	2.417	3.61	3.50	2.09
0.333	1.90	1.417	51.29	2.500	3.61	3.58	1.96
0.417	2.16	1.500	51.29	2.583	3.19	3.67	1.96
0.500	2.16	1.583	16.17	2.667	3.19	3.75	1.85
0.583	2.51	1.667	16.17	2.750	2.87	3.83	1.85
0.667	2.51	1.750	8.96	2.833	2.87	3.92	1.75
0.750	3.03	1.833	8.96	2.917	2.61	4.00	1.75
0.833	3.03	1.917	6.38	3.000	2.61	4.08	1.67
0.917	3.89	2.000	6.38	3.083	2.41	4.17	1.67
1.000	3.90	2.083	5.03	3.167	2.41		
1.083	5.69	2.167	5.03	3.250	2.23		

Unit Hyd Qpeak (cms)= 0.220

PEAK FLOW (cms)= 0.032 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 7.221
TOTAL RAINFALL (mm)= 24.999
RUNOFF COEFFICIENT = 0.289

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0008) | Area (ha)= 0.90
ID= 1 DT= 5.0 min | Total Imp(%)= 35.00 Dir. Conn.(%)= 0.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.31	0.58
Dep. Storage	(mm)=	4.20	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	77.46	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	5.69	2.250	4.19	3.33	2.23
0.167	0.00	1.250	12.56	2.333	4.19	3.42	2.09
0.250	1.90	1.333	12.56	2.417	3.61	3.50	2.09
0.333	1.90	1.417	51.29	2.500	3.61	3.58	1.96
0.417	2.16	1.500	51.29	2.583	3.19	3.67	1.96
0.500	2.16	1.583	16.17	2.667	3.19	3.75	1.85
0.583	2.51	1.667	16.17	2.750	2.87	3.83	1.85
0.667	2.51	1.750	8.96	2.833	2.87	3.92	1.75
0.750	3.03	1.833	8.96	2.917	2.61	4.00	1.75
0.833	3.03	1.917	6.38	3.000	2.61	4.08	1.67
0.917	3.89	2.000	6.38	3.083	2.41	4.17	1.67
1.000	3.90	2.083	5.03	3.167	2.41		
1.083	5.69	2.167	5.03	3.250	2.23		

				TOTALS
Max.Eff.Inten.(mm/hr)=		51.29	21.81	
over (min)		5.00	20.00	
Storage Coeff. (min)=		2.86 (ii)	15.84 (ii)	
Unit Hyd. Tpeak (min)=		5.00	20.00	
Unit Hyd. peak (cms)=		0.29	0.07	
PEAK FLOW	(cms)=	0.00	0.02	0.021 (iii)
TIME TO PEAK	(hrs)=	1.50	1.75	1.75
RUNOFF VOLUME	(mm)=	20.80	9.58	9.57
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	0.83	0.38	0.38

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0006) | Area (ha)= 0.56
ID= 1 DT= 5.0 min | Total Imp(%)= 33.00 Dir. Conn.(%)= 0.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.18	0.38
Dep. Storage	(mm)=	4.20	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	61.10	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	1.167	5.69	2.250	4.19	3.33	2.23
0.167	0.00	1.250	12.56	2.333	4.19	3.42	2.09
0.250	1.90	1.333	12.56	2.417	3.61	3.50	2.09
0.333	1.90	1.417	51.29	2.500	3.61	3.58	1.96
0.417	2.16	1.500	51.29	2.583	3.19	3.67	1.96
0.500	2.16	1.583	16.17	2.667	3.19	3.75	1.85
0.583	2.51	1.667	16.17	2.750	2.87	3.83	1.85
0.667	2.51	1.750	8.96	2.833	2.87	3.92	1.75
0.750	3.03	1.833	8.96	2.917	2.61	4.00	1.75
0.833	3.03	1.917	6.38	3.000	2.61	4.08	1.67
0.917	3.89	2.000	6.38	3.083	2.41	4.17	1.67
1.000	3.90	2.083	5.03	3.167	2.41		
1.083	5.69	2.167	5.03	3.250	2.23		

				TOTALS
Max.Eff.Inten.(mm/hr)=		51.29	20.66	
over (min)		5.00	20.00	
Storage Coeff. (min)=		2.48 (ii)	15.74 (ii)	
Unit Hyd. Tpeak (min)=		5.00	20.00	
Unit Hyd. peak (cms)=		0.30	0.07	
PEAK FLOW	(cms)=	0.00	0.01	0.013 (iii)
TIME TO PEAK	(hrs)=	1.50	1.75	1.75
RUNOFF VOLUME	(mm)=	20.80	9.38	9.37
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	0.83	0.38	0.37

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0012)
1 + 2 = 3

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0011):		3.43	0.056	1.75	7.56
+ ID2= 2 (0006):		0.56	0.013	1.75	9.37
ID = 3 (0012):		3.99	0.069	1.75	7.82

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0012)
3 + 2 = 1

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0012):		3.99	0.069	1.75	7.82
+ ID2= 2 (0007):		2.53	0.032	2.00	7.22
ID = 1 (0012):		6.52	0.095	1.83	7.59

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0012)
1 + 2 = 3

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0012):		6.52	0.095	1.83	7.59
+ ID2= 2 (0008):		0.90	0.021	1.75	9.57
ID = 3 (0012):		7.42	0.115	1.83	7.83

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0013)
1 + 2 = 3

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0012):		7.42	0.115	1.83	7.83
+ ID2= 2 (0009):		1.73	0.016	2.00	5.65
ID = 3 (0013):		9.15	0.130	1.83	7.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

10-094 BB Ranch
Visual OTTHYMO MODEL

10-Year Storm Event

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================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M M M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                 *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Natalie\AppData\Local\Civica\VH5\9e25fb98-d478-4630-
a3ea-01be0c2d9301\d3aa3123-ba2c-4a26-a76a-e4cfa4d5c4ea\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\9e25fb98-d478-4630-
a3ea-01be0c2d9301\d3aa3123-ba2c-4a26-a76a-e4cfa4d5c4ea\scen


DATE: 12/05/2023                          TIME: 10:01:01

USER:


COMMENTS: _____________________________________________________

--------------------------------------------------------------------------------
  ************************************************
  ** SIMULATION : 03_10-Year Norfolk            **
  ************************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 670.324
| Ptotal= 57.94 mm |                          B=   3.007
--------------------                          C=   0.698
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

    TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
     hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
    0.00    5.04 |  1.00   27.43 |  2.00   10.30 |  3.00    5.84
    0.17    5.66 |  1.17  111.84 |  2.17    9.03 |  3.17    5.49
    0.33    6.49 |  1.33   34.58 |  2.33    8.07 |  3.33    5.18
    0.50    7.70 |  1.50   20.31 |  2.50    7.33 |  3.50    4.92
    0.67    9.66 |  1.67   15.00 |  2.67    6.74 |  3.67    4.68
    0.83   13.55 |  1.83   12.13 |  2.83    6.25 |  3.83    4.47


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0003)|   Area     (ha)=   1.64   Curve Number    (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   4.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.27

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                        ---- TRANSFORMED HYETOGRAPH ----
    TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
     hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
   0.083    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
   0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
   0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
   0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
   0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
   0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
   0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
   0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
   0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
   0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
   0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
   1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

    Unit Hyd Qpeak  (cms)=   0.232

    PEAK FLOW       (cms)=   0.099 (i)
    TIME TO PEAK    (hrs)=   1.583
    RUNOFF VOLUME    (mm)=  26.363
    TOTAL RAINFALL   (mm)=  57.945
    RUNOFF COEFFICIENT   =   0.455

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area     (ha)=   2.23
|ID= 1 DT= 5.0 min |   Total Imp(%)=  27.00   Dir. Conn.(%)=   0.00
--------------------

                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=      0.60          1.63
    Dep. Storage     (mm)=      1.00          4.20
    Average Slope     (%)=      1.00          2.00
    Length            (m)=    121.93         40.00
    Mannings n           =     0.013         0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                        ---- TRANSFORMED HYETOGRAPH ----
    TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
     hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
   0.083    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
   0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
   0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
   0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
   0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
   0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
   0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
   0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
   0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
   0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
   0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
   1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

    Max.Eff.Inten.(mm/hr)=    111.84        79.82
              over (min)        5.00        15.00
    Storage Coeff.  (min)=      2.75 (ii)   10.48 (ii)
    Unit Hyd. Tpeak (min)=      5.00        15.00
    Unit Hyd. peak  (cms)=      0.29         0.09
                                                    *TOTALS*
    PEAK FLOW       (cms)=      0.00         0.22      0.215 (iii)
    TIME TO PEAK    (hrs)=      1.33         1.50       1.50
    RUNOFF VOLUME    (mm)=     56.94        31.51      31.51
    TOTAL RAINFALL   (mm)=     57.94        57.94      57.94
    RUNOFF COEFFICIENT   =      0.98         0.54       0.54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  82.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0002)|   Area     (ha)=   0.77
|ID= 1 DT= 5.0 min |   Total Imp(%)=  31.00   Dir. Conn.(%)=   0.00
--------------------

                          IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=      0.24          0.53
    Dep. Storage     (mm)=      1.00          4.20
    Average Slope     (%)=      1.00          2.00
    Length            (m)=     71.65         40.00
    Mannings n           =     0.013         0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                        ---- TRANSFORMED HYETOGRAPH ----
    TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
     hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
   0.083    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
   0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
   0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
   0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
   0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
   0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
   0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
   0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
   0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
   0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
   0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
   1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

    Max.Eff.Inten.(mm/hr)=    111.84        87.51
              over (min)        5.00        10.00
    Storage Coeff.  (min)=      2.00 (ii)    9.44 (ii)
    Unit Hyd. Tpeak (min)=      5.00        10.00
    Unit Hyd. peak  (cms)=      0.31         0.12
                                                    *TOTALS*
    PEAK FLOW       (cms)=      0.00         0.08      0.085 (iii)
    TIME TO PEAK    (hrs)=      1.33         1.42       1.42
    RUNOFF VOLUME    (mm)=     56.94        32.40      32.39
    TOTAL RAINFALL   (mm)=     57.94        57.94      57.94
    RUNOFF COEFFICIENT   =      0.98         0.56       0.56

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  82.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)      (mm)
       ID1= 1 (  0001):     2.23   0.215     1.50    31.51
     + ID2= 2 (  0002):     0.77   0.085     1.42    32.39
       ==========================================================
       ID = 3 (  0010):     3.00   0.286     1.50    31.73

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0010)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
```

10-094 BB Ranch
Visual OTTHYMO MODEL

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--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0010):     3.00   0.286     1.50    31.73
     + ID2= 2 (  0003):     1.64   0.099     1.58    26.36
       ================================================
       ID = 1 (  0010):     4.64   0.380     1.50    29.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0009)|   Area     (ha)=   1.73   Curve Number    (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   4.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.41

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
 0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
 0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
 0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
 0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
 0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
 0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
 0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
 0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
 0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
 0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
 1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

     Unit Hyd Qpeak  (cms)=   0.161

     PEAK FLOW       (cms)=   0.080 (i)
     TIME TO PEAK    (hrs)=   1.750
     RUNOFF VOLUME    (mm)=  26.375
     TOTAL RAINFALL   (mm)=  57.945
     RUNOFF COEFFICIENT   =   0.455

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0005)|   Area     (ha)=   0.83   Curve Number    (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   1.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.23

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
 0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
 0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
 0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
 0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
 0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
 0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
 0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
 0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
 0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
 0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
 1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

     Unit Hyd Qpeak  (cms)=   0.138

     PEAK FLOW       (cms)=   0.061 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=  28.740
     TOTAL RAINFALL   (mm)=  57.945
     RUNOFF COEFFICIENT   =   0.496

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0004)|   Area     (ha)=   2.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  27.00   Dir. Conn.(%)=   0.00
--------------------

                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         1.90
     Dep. Storage     (mm)=       1.00         4.20
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     131.66        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
 0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
 0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
 0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
 0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
 0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
 0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
 0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
 0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
 0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
 0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
 1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

     Max.Eff.Inten.(mm/hr)=     111.84        79.82
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       2.88 (ii)   10.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.29         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.25      0.250 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50       1.50
     RUNOFF VOLUME    (mm)=      56.94        31.51      31.51
     TOTAL RAINFALL   (mm)=      57.94        57.94      57.94
     RUNOFF COEFFICIENT   =       0.98         0.54       0.54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  82.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0004):     2.60   0.250     1.50    31.51
     + ID2= 2 (  0005):     0.83   0.061     1.50    28.74
       ================================================
       ID = 3 (  0011):     3.43   0.311     1.50    30.84

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0007)|   Area     (ha)=   2.53   Curve Number    (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   1.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.44

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
 0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
 0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
 0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
 0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
 0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
 0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
 0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
 0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
 0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
 0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
 1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

     Unit Hyd Qpeak  (cms)=   0.220

     PEAK FLOW       (cms)=   0.125 (i)
     TIME TO PEAK    (hrs)=   1.833
     RUNOFF VOLUME    (mm)=  28.770
     TOTAL RAINFALL   (mm)=  57.945
     RUNOFF COEFFICIENT   =   0.497

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0008)|   Area     (ha)=   0.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  35.00   Dir. Conn.(%)=   0.00
--------------------

                         IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.31         0.58
     Dep. Storage     (mm)=       4.20         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      77.46        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    5.04 | 1.083   27.43 | 2.083   10.30 |  3.08    5.84
 0.167    5.04 | 1.167   27.43 | 2.167   10.30 |  3.17    5.84
 0.250    5.66 | 1.250  111.84 | 2.250    9.03 |  3.25    5.49
 0.333    5.66 | 1.333  111.84 | 2.333    9.03 |  3.33    5.49
 0.417    6.49 | 1.417   34.58 | 2.417    8.07 |  3.42    5.18
 0.500    6.49 | 1.500   34.58 | 2.500    8.07 |  3.50    5.18
 0.583    7.70 | 1.583   20.31 | 2.583    7.33 |  3.58    4.92
 0.667    7.70 | 1.667   20.31 | 2.667    7.33 |  3.67    4.92
 0.750    9.66 | 1.750   15.00 | 2.750    6.74 |  3.75    4.68
 0.833    9.66 | 1.833   15.00 | 2.833    6.74 |  3.83    4.68
 0.917   13.55 | 1.917   12.13 | 2.917    6.25 |  3.92    4.47
 1.000   13.55 | 2.000   12.13 | 3.000    6.25 |  4.00    4.47

     Max.Eff.Inten.(mm/hr)=     111.84       101.03
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.10 (ii)    9.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.11      0.109 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42       1.42
     RUNOFF VOLUME    (mm)=      53.74        34.82      34.81
     TOTAL RAINFALL   (mm)=      57.94        57.94      57.94
     RUNOFF COEFFICIENT   =       0.93         0.60       0.60
```

10-094 BB Ranch
Visual OTTHYMO MODEL

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0006)	Area (ha)=	0.56
ID= 1 DT= 5.0 min	Total Imp(%)=	33.00 Dir. Conn.(%)= 0.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.18	0.38
Dep. Storage	(mm)=	4.20	1.50
Average Slope	(%)=	1.00	2.00
Length	(m)=	61.10	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
1.000	13.55	2.000	12.13	3.000	6.25	4.00	4.47

Max.Eff.Inten.(mm/hr)=		111.84	96.49	
over (min)		5.00	10.00	
Storage Coeff. (min)=		1.82 (ii)	8.98 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.32	0.12	
				TOTALS
PEAK FLOW	(cms)=	0.00	0.07	0.067 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.42
RUNOFF VOLUME	(mm)=	53.74	34.38	34.38
TOTAL RAINFALL	(mm)=	57.94	57.94	57.94
RUNOFF COEFFICIENT	=	0.93	0.59	0.59

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 82.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0012)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0011):		3.43	0.311	1.50	30.84
+ ID2= 2 (0006):		0.56	0.067	1.42	34.38
ID = 3 (0012):		3.99	0.366	1.50	31.33

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0012)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0012):		3.99	0.366	1.50	31.33
+ ID2= 2 (0007):		2.53	0.125	1.83	28.77
ID = 1 (0012):		6.52	0.454	1.50	30.34

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0012)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0012):		6.52	0.454	1.50	30.34
+ ID2= 2 (0008):		0.90	0.109	1.42	34.81
ID = 3 (0012):		7.42	0.543	1.50	30.88

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0013)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0012):		7.42	0.543	1.50	30.88
+ ID2= 2 (0009):		1.73	0.080	1.75	26.38
ID = 3 (0013):		9.15	0.601	1.50	30.03

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

10-094 BB Ranch
Visual OTTHYMO MODEL

100-Year Storm Event

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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2015)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat
  Output  filename: C:\Users\Natalie\AppData\Local\Civica\VH5\9e25fb98-d478-4630-
a3ea-01be0c2d9301\36fa43f6-8bda-41be-8904-a0ff7fb2d662\scen
  Summary filename: C:\Users\Natalie\AppData\Local\Civica\VH5\9e25fb98-d478-4630-
a3ea-01be0c2d9301\36fa43f6-8bda-41be-8904-a0ff7fb2d662\scen


DATE: 12/05/2023                          TIME: 10:01:01

USER:


COMMENTS: _____

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  ************************************************
  ** SIMULATION : 06_100-Year Norfolk           **
  ************************************************

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| CHICAGO STORM    |    IDF curve parameters: A= 801.041
| Ptotal= 87.09 mm |                          B=   1.501
--------------------                          C=   0.657
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =  0.33

                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.00    8.40 |  1.00   38.70 |  2.00   16.17 |  3.00    9.61
                0.17    9.34 |  1.17  160.97 |  2.17   14.33 |  3.17    9.08
                0.33   10.59 |  1.33   47.72 |  2.33   12.95 |  3.33    8.61
                0.50   12.39 |  1.50   29.71 |  2.50   11.86 |  3.50    8.20
                0.67   15.24 |  1.67   22.67 |  2.67   10.97 |  3.67    7.84
                0.83   20.69 |  1.83   18.74 |  2.83   10.24 |  3.83    7.51


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--------------------
| CALIB            |
| NASHYD   (  0003)|   Area    (ha)=   1.64   Curve Number   (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   4.20   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.27

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    8.40 | 1.083   38.70 | 2.083   16.17 |  3.08    9.61
               0.167    8.40 | 1.167   38.70 | 2.167   16.17 |  3.17    9.61
               0.250    9.34 | 1.250  160.97 | 2.250   14.33 |  3.25    9.08
               0.333    9.34 | 1.333  160.97 | 2.333   14.33 |  3.33    9.08
               0.417   10.59 | 1.417   47.72 | 2.417   12.95 |  3.42    8.61
               0.500   10.59 | 1.500   47.72 | 2.500   12.95 |  3.50    8.61
               0.583   12.39 | 1.583   29.71 | 2.583   11.86 |  3.58    8.20
               0.667   12.39 | 1.667   29.71 | 2.667   11.86 |  3.67    8.20
               0.750   15.24 | 1.750   22.67 | 2.750   10.97 |  3.75    7.84
               0.833   15.24 | 1.833   22.67 | 2.833   10.97 |  3.83    7.84
               0.917   20.69 | 1.917   18.74 | 2.917   10.24 |  3.92    7.51
               1.000   20.69 | 2.000   18.74 | 3.000   10.24 |  4.00    7.51

    Unit Hyd Qpeak  (cms)=   0.232

    PEAK FLOW       (cms)=   0.184 (i)
    TIME TO PEAK    (hrs)=   1.583
    RUNOFF VOLUME    (mm)=  49.526
    TOTAL RAINFALL   (mm)=  87.089
    RUNOFF COEFFICIENT   =   0.569

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0001)|   Area    (ha)=   2.23
|ID= 1 DT= 5.0 min |   Total Imp(%)=  27.00   Dir. Conn.(%)=   0.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.60         1.63
    Dep. Storage     (mm)=       1.00         4.20
    Average Slope     (%)=       1.00         2.00
    Length            (m)=     121.93        40.00
    Mannings n            =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    8.40 | 1.083   38.70 | 2.083   16.17 |  3.08    9.61
               0.167    8.40 | 1.167   38.70 | 2.167   16.17 |  3.17    9.61
               0.250    9.34 | 1.250  160.97 | 2.250   14.33 |  3.25    9.08
               0.333    9.34 | 1.333  160.97 | 2.333   14.33 |  3.33    9.08
               0.417   10.59 | 1.417   47.72 | 2.417   12.95 |  3.42    8.61
               0.500   10.59 | 1.500   47.72 | 2.500   12.95 |  3.50    8.61
               0.583   12.39 | 1.583   29.71 | 2.583   11.86 |  3.58    8.20
               0.667   12.39 | 1.667   29.71 | 2.667   11.86 |  3.67    8.20
               0.750   15.24 | 1.750   22.67 | 2.750   10.97 |  3.75    7.84
               0.833   15.24 | 1.833   22.67 | 2.833   10.97 |  3.83    7.84
               0.917   20.69 | 1.917   18.74 | 2.917   10.24 |  3.92    7.51
               1.000   20.69 | 2.000   18.74 | 3.000   10.24 |  4.00    7.51

    Max.Eff.Inten.(mm/hr)=     160.97       143.74
              over (min)          5.00        10.00
    Storage Coeff.  (min)=        2.38 (ii)    8.48 (ii)
    Unit Hyd. Tpeak (min)=        5.00        10.00
    Unit Hyd. peak  (cms)=        0.30         0.12
                                                      *TOTALS*
    PEAK FLOW       (cms)=        0.00         0.44          0.441 (iii)
    TIME TO PEAK    (hrs)=        1.33         1.42           1.42
    RUNOFF VOLUME    (mm)=       86.09        56.60          56.60
    TOTAL RAINFALL   (mm)=       87.09        87.09          87.09
    RUNOFF COEFFICIENT   =        0.99         0.65           0.65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  82.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0002)|   Area    (ha)=   0.77
|ID= 1 DT= 5.0 min |   Total Imp(%)=  31.00   Dir. Conn.(%)=   0.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.24         0.53
    Dep. Storage     (mm)=       1.00         4.20
    Average Slope     (%)=       1.00         2.00
    Length            (m)=      71.65        40.00
    Mannings n            =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    8.40 | 1.083   38.70 | 2.083   16.17 |  3.08    9.61
               0.167    8.40 | 1.167   38.70 | 2.167   16.17 |  3.17    9.61
               0.250    9.34 | 1.250  160.97 | 2.250   14.33 |  3.25    9.08
               0.333    9.34 | 1.333  160.97 | 2.333   14.33 |  3.33    9.08
               0.417   10.59 | 1.417   47.72 | 2.417   12.95 |  3.42    8.61
               0.500   10.59 | 1.500   47.72 | 2.500   12.95 |  3.50    8.61
               0.583   12.39 | 1.583   29.71 | 2.583   11.86 |  3.58    8.20
               0.667   12.39 | 1.667   29.71 | 2.667   11.86 |  3.67    8.20
               0.750   15.24 | 1.750   22.67 | 2.750   10.97 |  3.75    7.84
               0.833   15.24 | 1.833   22.67 | 2.833   10.97 |  3.83    7.84
               0.917   20.69 | 1.917   18.74 | 2.917   10.24 |  3.92    7.51
               1.000   20.69 | 2.000   18.74 | 3.000   10.24 |  4.00    7.51

    Max.Eff.Inten.(mm/hr)=     160.97       156.10
              over (min)          5.00        10.00
    Storage Coeff.  (min)=        1.73 (ii)    7.64 (ii)
    Unit Hyd. Tpeak (min)=        5.00        10.00
    Unit Hyd. peak  (cms)=        0.32         0.13
                                                      *TOTALS*
    PEAK FLOW       (cms)=        0.00         0.16          0.162 (iii)
    TIME TO PEAK    (hrs)=        1.33         1.42           1.42
    RUNOFF VOLUME    (mm)=       86.09        57.79          57.78
    TOTAL RAINFALL   (mm)=       87.09        87.09          87.09
    RUNOFF COEFFICIENT   =        0.99         0.66           0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  82.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0010)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------            (ha)    (cms)    (hrs)      (mm)
        ID1= 1 (  0001):     2.23   0.441     1.42    56.60
      + ID2= 2 (  0002):     0.77   0.162     1.42    57.78
        ================================================
        ID = 3 (  0010):     3.00   0.603     1.42    56.90

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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10-094 BB Ranch
Visual OTTHYMO MODEL

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| ADD HYD  (  0010)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0010):     3.00   0.603     1.42    56.90
     + ID2= 2 (  0003):     1.64   0.184     1.58    49.53
       ================================================
       ID = 1 (  0010):     4.64   0.754     1.42    54.30

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0009)|   Area     (ha)=   1.73   Curve Number    (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   4.20   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.41

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    8.40 | 1.083   38.70 | 2.083   16.17 |  3.08    9.61
 0.167    8.40 | 1.167   38.70 | 2.167   16.17 |  3.17    9.61
 0.250    9.34 | 1.250  160.97 | 2.250   14.33 |  3.25    9.08
 0.333    9.34 | 1.333  160.97 | 2.333   14.33 |  3.33    9.08
 0.417   10.59 | 1.417   47.72 | 2.417   12.95 |  3.42    8.61
 0.500   10.59 | 1.500   47.72 | 2.500   12.95 |  3.50    8.61
 0.583   12.39 | 1.583   29.71 | 2.583   11.86 |  3.58    8.20
 0.667   12.39 | 1.667   29.71 | 2.667   11.86 |  3.67    8.20
 0.750   15.24 | 1.750   22.67 | 2.750   10.97 |  3.75    7.84
 0.833   15.24 | 1.833   22.67 | 2.833   10.97 |  3.83    7.84
 0.917   20.69 | 1.917   18.74 | 2.917   10.24 |  3.92    7.51
 1.000   20.69 | 2.000   18.74 | 3.000   10.24 |  4.00    7.51

    Unit Hyd Qpeak  (cms)=   0.161

    PEAK FLOW       (cms)=   0.150 (i)
    TIME TO PEAK    (hrs)=   1.750
    RUNOFF VOLUME    (mm)=  49.549
    TOTAL RAINFALL   (mm)=  87.089
    RUNOFF COEFFICIENT   =   0.569

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  0005)|   Area     (ha)=   0.83   Curve Number    (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   1.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.23

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    8.40 | 1.083   38.70 | 2.083   16.17 |  3.08    9.61
 0.167    8.40 | 1.167   38.70 | 2.167   16.17 |  3.17    9.61
 0.250    9.34 | 1.250  160.97 | 2.250   14.33 |  3.25    9.08
 0.333    9.34 | 1.333  160.97 | 2.333   14.33 |  3.33    9.08
 0.417   10.59 | 1.417   47.72 | 2.417   12.95 |  3.42    8.61
 0.500   10.59 | 1.500   47.72 | 2.500   12.95 |  3.50    8.61
 0.583   12.39 | 1.583   29.71 | 2.583   11.86 |  3.58    8.20
 0.667   12.39 | 1.667   29.71 | 2.667   11.86 |  3.67    8.20
 0.750   15.24 | 1.750   22.67 | 2.750   10.97 |  3.75    7.84
 0.833   15.24 | 1.833   22.67 | 2.833   10.97 |  3.83    7.84
 0.917   20.69 | 1.917   18.74 | 2.917   10.24 |  3.92    7.51
 1.000   20.69 | 2.000   18.74 | 3.000   10.24 |  4.00    7.51

    Unit Hyd Qpeak  (cms)=   0.138

    PEAK FLOW       (cms)=   0.109 (i)
    TIME TO PEAK    (hrs)=   1.500
    RUNOFF VOLUME    (mm)=  52.191
    TOTAL RAINFALL   (mm)=  87.089
    RUNOFF COEFFICIENT   =   0.599

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0004)|   Area     (ha)=   2.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  27.00   Dir. Conn.(%)=   0.00
-------------------

                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.70         1.90
    Dep. Storage     (mm)=       1.00         4.20
    Average Slope     (%)=       1.00         2.00
    Length            (m)=     131.66        40.00
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    8.40 | 1.083   38.70 | 2.083   16.17 |  3.08    9.61
 0.167    8.40 | 1.167   38.70 | 2.167   16.17 |  3.17    9.61
 0.250    9.34 | 1.250  160.97 | 2.250   14.33 |  3.25    9.08
 0.333    9.34 | 1.333  160.97 | 2.333   14.33 |  3.33    9.08
 0.417   10.59 | 1.417   47.72 | 2.417   12.95 |  3.42    8.61
 0.500   10.59 | 1.500   47.72 | 2.500   12.95 |  3.50    8.61
 0.583   12.39 | 1.583   29.71 | 2.583   11.86 |  3.58    8.20
 0.667   12.39 | 1.667   29.71 | 2.667   11.86 |  3.67    8.20
 0.750   15.24 | 1.750   22.67 | 2.750   10.97 |  3.75    7.84
 0.833   15.24 | 1.833   22.67 | 2.833   10.97 |  3.83    7.84
 0.917   20.69 | 1.917   18.74 | 2.917   10.24 |  3.92    7.51
 1.000   20.69 | 2.000   18.74 | 3.000   10.24 |  4.00    7.51

    Max.Eff.Inten.(mm/hr)=     160.97       143.74
              over (min)        5.00        10.00
    Storage Coeff.  (min)=       2.49 (ii)    8.59 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.30         0.12
                                                      *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.51        0.512 (iii)
    TIME TO PEAK    (hrs)=       1.33         1.42         1.42
    RUNOFF VOLUME    (mm)=      86.09        56.60        56.60
    TOTAL RAINFALL   (mm)=      87.09        87.09        87.09
    RUNOFF COEFFICIENT   =       0.99         0.65         0.65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
          CN*  =  82.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0011)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0004):     2.60   0.512     1.42    56.60
     + ID2= 2 (  0005):     0.83   0.109     1.50    52.19
       ================================================
       ID = 3 (  0011):     3.43   0.612     1.42    55.53

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| CALIB            |
| NASHYD   (  0007)|   Area     (ha)=   2.53   Curve Number    (CN)= 82.0
|ID= 1 DT= 5.0 min |   Ia       (mm)=   1.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.44

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    8.40 | 1.083   38.70 | 2.083   16.17 |  3.08    9.61
 0.167    8.40 | 1.167   38.70 | 2.167   16.17 |  3.17    9.61
 0.250    9.34 | 1.250  160.97 | 2.250   14.33 |  3.25    9.08
 0.333    9.34 | 1.333  160.97 | 2.333   14.33 |  3.33    9.08
 0.417   10.59 | 1.417   47.72 | 2.417   12.95 |  3.42    8.61
 0.500   10.59 | 1.500   47.72 | 2.500   12.95 |  3.50    8.61
 0.583   12.39 | 1.583   29.71 | 2.583   11.86 |  3.58    8.20
 0.667   12.39 | 1.667   29.71 | 2.667   11.86 |  3.67    8.20
 0.750   15.24 | 1.750   22.67 | 2.750   10.97 |  3.75    7.84
 0.833   15.24 | 1.833   22.67 | 2.833   10.97 |  3.83    7.84
 0.917   20.69 | 1.917   18.74 | 2.917   10.24 |  3.92    7.51
 1.000   20.69 | 2.000   18.74 | 3.000   10.24 |  4.00    7.51

    Unit Hyd Qpeak  (cms)=   0.220

    PEAK FLOW       (cms)=   0.222 (i)
    TIME TO PEAK    (hrs)=   1.750
    RUNOFF VOLUME    (mm)=  52.244
    TOTAL RAINFALL   (mm)=  87.089
    RUNOFF COEFFICIENT   =   0.600

    (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0008)|   Area     (ha)=   0.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  35.00   Dir. Conn.(%)=   0.00
-------------------

                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.31         0.58
    Dep. Storage     (mm)=       4.20         1.50
    Average Slope     (%)=       1.00         2.00
    Length            (m)=      77.46        40.00
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                          ---- TRANSFORMED HYETOGRAPH ----
  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
 0.083    8.40 | 1.083   38.70 | 2.083   16.17 |  3.08    9.61
 0.167    8.40 | 1.167   38.70 | 2.167   16.17 |  3.17    9.61
 0.250    9.34 | 1.250  160.97 | 2.250   14.33 |  3.25    9.08
 0.333    9.34 | 1.333  160.97 | 2.333   14.33 |  3.33    9.08
 0.417   10.59 | 1.417   47.72 | 2.417   12.95 |  3.42    8.61
 0.500   10.59 | 1.500   47.72 | 2.500   12.95 |  3.50    8.61
 0.583   12.39 | 1.583   29.71 | 2.583   11.86 |  3.58    8.20
 0.667   12.39 | 1.667   29.71 | 2.667   11.86 |  3.67    8.20
 0.750   15.24 | 1.750   22.67 | 2.750   10.97 |  3.75    7.84
 0.833   15.24 | 1.833   22.67 | 2.833   10.97 |  3.83    7.84
 0.917   20.69 | 1.917   18.74 | 2.917   10.24 |  3.92    7.51
 1.000   20.69 | 2.000   18.74 | 3.000   10.24 |  4.00    7.51

    Max.Eff.Inten.(mm/hr)=     160.97       174.24
              over (min)        5.00        10.00
    Storage Coeff.  (min)=       1.81 (ii)    7.46 (ii)
    Unit Hyd. Tpeak (min)=       5.00        10.00
    Unit Hyd. peak  (cms)=       0.32         0.13
                                                      *TOTALS*
    PEAK FLOW       (cms)=       0.00         0.20        0.200 (iii)
    TIME TO PEAK    (hrs)=       1.33         1.42         1.42
    RUNOFF VOLUME    (mm)=      82.89        60.61        60.60
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     TOTAL RAINFALL   (mm)=      87.09        87.09          87.09
     RUNOFF COEFFICIENT   =       0.95         0.70           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  82.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0006)|   Area    (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  33.00   Dir. Conn.(%)=   0.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.18         0.38
     Dep. Storage     (mm)=       4.20         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      61.10        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    8.40 | 1.083   38.70 | 2.083   16.17 |  3.08    9.61
               0.167    8.40 | 1.167   38.70 | 2.167   16.17 |  3.17    9.61
               0.250    9.34 | 1.250  160.97 | 2.250   14.33 |  3.25    9.08
               0.333    9.34 | 1.333  160.97 | 2.333   14.33 |  3.33    9.08
               0.417   10.59 | 1.417   47.72 | 2.417   12.95 |  3.42    8.61
               0.500   10.59 | 1.500   47.72 | 2.500   12.95 |  3.50    8.61
               0.583   12.39 | 1.583   29.71 | 2.583   11.86 |  3.58    8.20
               0.667   12.39 | 1.667   29.71 | 2.667   11.86 |  3.67    8.20
               0.750   15.24 | 1.750   22.67 | 2.750   10.97 |  3.75    7.84
               0.833   15.24 | 1.833   22.67 | 2.833   10.97 |  3.83    7.84
               0.917   20.69 | 1.917   18.74 | 2.917   10.24 |  3.92    7.51
               1.000   20.69 | 2.000   18.74 | 3.000   10.24 |  4.00    7.51

     Max.Eff.Inten.(mm/hr)=     160.97       167.05
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.57 (ii)    7.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.33         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.12          0.124 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42            1.42
     RUNOFF VOLUME    (mm)=      82.89        60.03           60.02
     TOTAL RAINFALL   (mm)=      87.09        87.09           87.09
     RUNOFF COEFFICIENT   =       0.95         0.69            0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  82.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0012)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
       ID1= 1 (  0011):     3.43   0.612     1.42    55.53
     + ID2= 2 (  0006):     0.56   0.124     1.42    60.02
       ====================================================
       ID = 3 (  0012):     3.99   0.736     1.42    56.16

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0012)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
       ID1= 3 (  0012):     3.99   0.736     1.42    56.16
     + ID2= 2 (  0007):     2.53   0.222     1.75    52.24
       ====================================================
       ID = 1 (  0012):     6.52   0.858     1.42    54.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0012)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
       ID1= 1 (  0012):     6.52   0.858     1.42    54.64
     + ID2= 2 (  0008):     0.90   0.200     1.42    60.60
       ====================================================
       ID = 3 (  0012):     7.42   1.058     1.42    55.37

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  0013)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)      (mm)
       ID1= 1 (  0012):     7.42   1.058     1.42    55.37
     + ID2= 2 (  0009):     1.73   0.150     1.75    49.55
       ====================================================
       ID = 3 (  0013):     9.15   1.142     1.42    54.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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 FINISH
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NOTE:

BEARINGS ARE ASTRONOMIC AND ARE REFFERED TO THE EASTERLY LIMIT OF FRONT ROAD AS SHOWN ON PLAN 37R–10170, HAVING A BEARING OF N29°28'10"W, AND CAN BE CONVERTED TO GRID BY APPLYING A ROTATION OF 0°20'30" COUNTER CLOCKWISE.
DISTANCES AND COORDINATES ARE METRIC GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.999687184 THEN DIVIDING BY 0.3048 TO CONVERT TO IMPERIAL.
RESULTANT BEARINGS FROM COORDINATE TABLE ARE UTM GRID, DERIVED FROM SIMULTANEOUS GPS OBSERVATIONS ON MONUMENT A TO B, HAVING A BEARING OF N29°48'40"W, UTM ZONE 17, (81° WEST LONGITUDE) NAD83 (CSRS) (2010)

OBSERVED REFERENCE POINTS (ORPs): DERIVED FROM GPS OBSERVATIONS USING THE CAN–NET NETWORK, UTM ZONE 17 (81° WEST LONGITUDE) NAD83 (CSRS) (2010) COORDINATES ARE TO A RURAL ACCURACY AS PER SEC. 14 (2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
ORP A	4721946.319	547026.492
ORP B	4722168.149	546899.391

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE–ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

PLAN OF SURVEY
OF PART OF
LOTS 21 AND 22 CONCESSION 1
IN THE GEOGRAPHIC
TOWNSHIP OF SOUTH WALSINGHAM
IN
NORFOLK COUNTY

SCALE: 1 : 1250

12.5 0 50 METRES

JEWITT AND DIXON LTD.

METRIC NOTE:

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT.

DATED 2023

R. C. DIXON
ONTARIO LAND SURVEYOR

PLAN 37R–_____

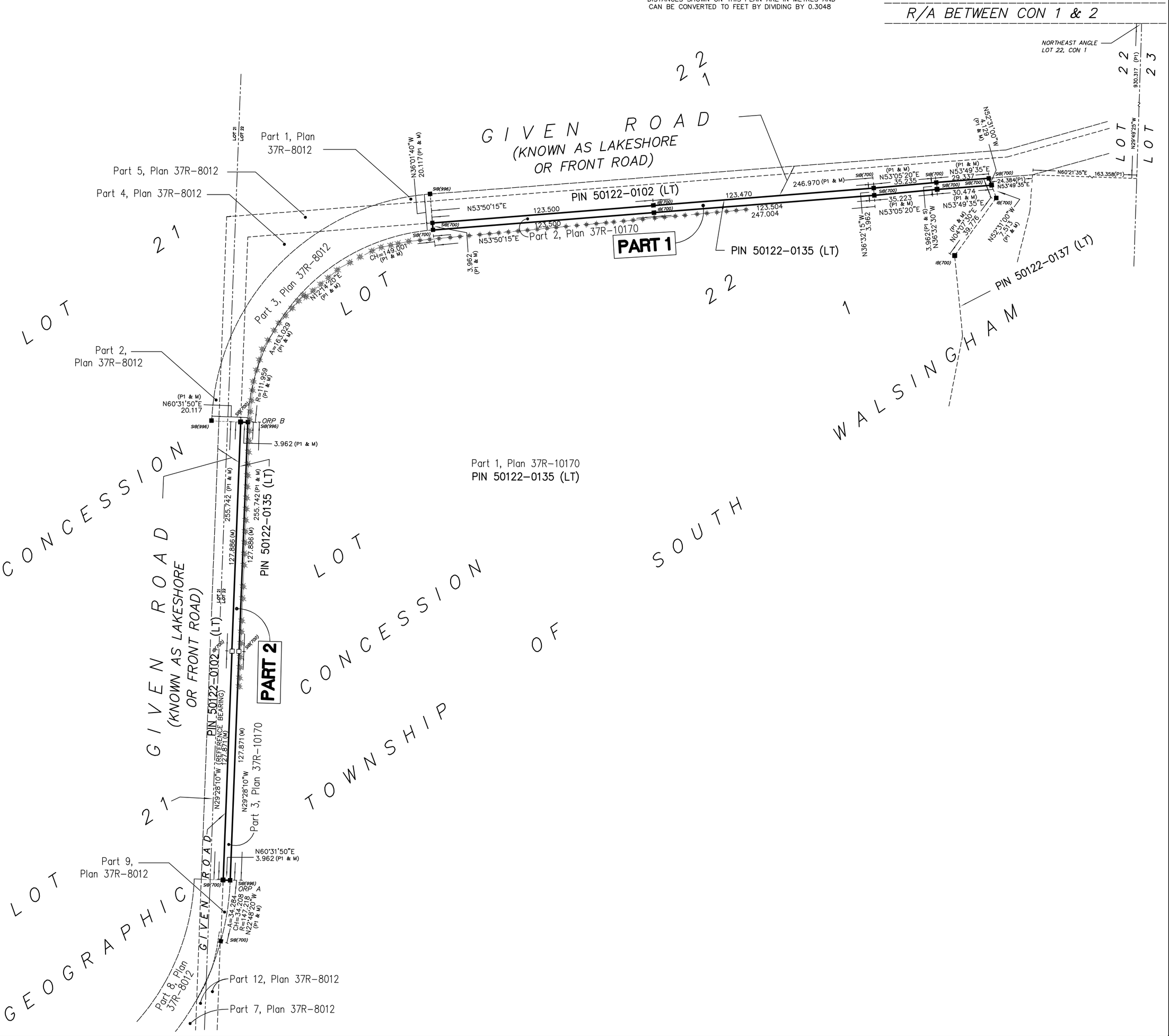
RECEIVED AND DEPOSITED

DATED _____

LAND REGISTRAR FOR THE LAND TITLES DIVISION OF NORFOLK (No. 37)

SCHEDULE

PART	PART LOT	CONCESSION	PIN No.	AREA (sq.m)
1	PART OF LOT 22	CONCESSION 1	PART OF PIN 50122–0135 (LT)	1236.662 sq.m
2	PART OF LOT 22	CONCESSION 1	PART OF PIN 50122–0135 (LT)	1013.250 sq.m



SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, AND THE LAND TITLES ACT, AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE

DATED:

R. C. DIXON
ONTARIO LAND SURVEYOR

THIS PLAN OF SURVEY RELATES TO AOLS PLAN SUBMISSION FORM NUMBER V–

LEGEND

2.5cm X 2.5cm X 1.2m STANDARD IRON BARS	SHOWN	SIB	
1.6cm X 1.6cm X 0.6m IRON BARS	SHOWN	IB	
1.6cm ROUND X 0.6m IRON BARS	SHOWN	IB Ø	
LOT LINES	SHOWN		
DEED LINES	SHOWN		
FENCE LINES	SHOWN		
ROAD LINES	SHOWN		
FOUND IRON BARS	SHOWN	PLANTED IRON BARS	SHOWN

JEWITT AND DIXON LTD.	SHOWN	(700)
J. B. DODD, O.L.S.	SHOWN	(996)
WITNESS MONUMENT	SHOWN	(WIT)
ORIGIN UNKNOWN	SHOWN	(OU)
PLAN 37R–10170	SHOWN	(P1)

JEWITT AND DIXON LTD.
ONTARIO LAND SURVEYORS
650 IRELAND ROAD, SIMCOE, ONTARIO, N3Y 4K2
PHONE: (519) 426–0842
E–mail: info@jewittdixon.com

F.W. – J.D.
BOOK – LL–FILE
CALC. – J.L.M.
PLAN – J.L.M.
CHECK – K.H.
CLIENT– BB INVESTMENTS
JOB No. – 22–3632

22–3632–RP

NOTE:

BEARINGS ARE ASTRONOMIC AND ARE REFFERED TO THE EASTERLY LIMIT OF FRONT ROAD AS SHOWN ON PLAN 37R–10170, HAVING A BEARING OF N29°28'10"W, AND CAN BE CONVERTED TO GRID BY APPLYING A ROTATION OF 0°20'30" COUNTER CLOCKWISE.
DISTANCES AND COORDINATES ARE METRIC GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY A COMBINED SCALE FACTOR OF 0.999687184 THEN DIVIDING BY 0.3048 TO CONVERT TO IMPERIAL.
RESULTANT BEARINGS FROM COORDINATE TABLE ARE UTM GRID, DERIVED FROM SIMULTANEOUS GPS OBSERVATIONS ON MONUMENT A TO B, HAVING A BEARING OF N29°48'40"W, UTM ZONE 17, (81° WEST LONGITUDE) NAD83 (CSRS) (2010)

OBSERVED REFERENCE POINTS (ORPs): DERIVED FROM GPS OBSERVATIONS USING THE CAN–NET NETWORK, UTM ZONE 17 (81° WEST LONGITUDE) NAD83 (CSRS) (2010) COORDINATES ARE TO A RURAL ACCURACY AS PER SEC. 14 (2) OF O.REG. 216/10

POINT ID	NORTHING	EASTING
ORP A	4721946.319	547026.492
ORP B	4722168.149	546899.391

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE–ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

PLAN OF SURVEY
OF PART OF
LOTS 21 AND 22
CONCESSION 1
IN THE GEOGRAPHIC
TOWNSHIP OF SOUTH WALSINGHAM
IN
NORFOLK COUNTY
SCALE: 1 : 1250

12.5 0 50 METRES

JEWITT AND DIXON LTD.

METRIC NOTE:

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT.

DATED FEBRUARY 14, 2023

R. C. DIXON
ONTARIO LAND SURVEYOR

PLAN 37R–_____

RECEIVED AND DEPOSITED

DATED _____

LAND REGISTRAR FOR THE LAND TITLES DIVISION OF NORFOLK (No. 37)

SCHEDULE

PART	PART LOT	CONCESSION	PIN No.	AREA (sq.m)
1	PART OF LOTS 21 AND 22	CONCESSION 1	PART OF PIN 50122–0135 (LT)	239894.65 sq.m

R/A BETWEEN CON 1 & 2

NORTHEAST ANGLE LOT 22, CON 1

GIVEN ROAD (KNOWN AS LAKESHORE OR FRONT ROAD)

Part 1, Plan 37R–8012
Part 5, Plan 37R–8012
Part 4, Plan 37R–8012
Part 3, Plan 37R–8012
Part 2, Plan 37R–8012
Part 9, Plan 37R–8012
Part 8, Plan 37R–8012
Part 7, Plan 37R–8012
Part 6, Plan 37R–8012
Part 12, Plan 37R–8012
Part 11, Plan 37R–8012

PIN 50122–0102 (LT)
PIN 50122–0135 (LT)
PIN 50122–0134 (LT)
PIN 50122–0137 (LT)
Part 1, Plan 37R–1544
PIN 50122–0136 (LT)

Part 2, Plan 37R–10170

ORP A
ORP B

THIS LINE IS SHOWN ON A PLAN OF SURVEY BY H. V. JEWITT, O.L.S., DATED JULY 2, 1952)

CENTRELINE OF GULLY AS SURVEYED BY H.V. JEWITT, O.L.S. DATED JUNE 28, 1955

TRAVERSE LINE ONLY

WATER'S EDGE OF LAKE ERIE TAKEN ON THE 14TH DAY OF DECEMBER, 2022

LAKE ERIE

BLOCK 50260

LOT 21 CONCESSION 1 GEOGRAPHIC TOWNSHIP OF SOUTH WALSINGHAM

LOT 22 CONCESSION 1 GEOGRAPHIC TOWNSHIP OF SOUTH WALSINGHAM

PART 1

Part 1, Plan 37R–10170
PIN 50122–0135 (LT)

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, AND THE LAND TITLES ACT, AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 6TH DAY OF FEBRUARY, 2023.

DATED: FEBRUARY 14, 2023

R. C. DIXON
ONTARIO LAND SURVEYOR

THIS PLAN OF SURVEY RELATES TO AOLS PLAN SUBMISSION FORM NUMBER V–42884

LEGEND

2.5cm X 2.5cm X 1.2m STANDARD IRON BARS	SHOWN	SIB	
1.6cm X 1.6cm X 0.6m IRON BARS	SHOWN	IB	
1.6cm ROUND X 0.6m IRON BARS	SHOWN	IB Ø	
LOT LINES	SHOWN		
DEED LINES	SHOWN		
FENCE LINES	SHOWN		
ROAD LINES	SHOWN		
FOUND IRON BARS	SHOWN	PLANTED IRON BARS	SHOWN

JEWITT AND DIXON LTD.	SHOWN (700)
J. B. DODD, O.L.S.	SHOWN (996)
WITNESS MONUMENT	SHOWN (WIT)
ORIGIN UNKNOWN	SHOWN (OU)
PLAN 37R–10170	SHOWN (P1)

JEWITT AND DIXON LTD.
ONTARIO LAND SURVEYORS

51 PARK ROAD, SIMCOE, ONTARIO, N3Y 4J9
PHONE: (519) 426–0842
E–mail: info@jewittdixon.com

F.W. – J.D.
BOOK – LL–FILE
CALC. – J.L.M.
PLAN – J.L.M.
CHECK – K.H.
CLIENT – BB INVESTMENTS
JOB No. – 22–3632

22–3632–LTAP

NO	DATE	DESCRIPTION
A	23.08.31	ISSUED FOR REVIEW
B	23.09.28	ISSUED FOR REVIEW
C	23.09.29	ISSUED FOR REVIEW

REVISIONS

DO NOT SCALE THE DRAWING

THE CONTRACTOR IS RESPONSIBLE TO VERIFY SITE CONDITIONS AND REPORT ANY ERRORS OR OMISSIONS TO THE ENGINEER

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PROJECT NORTH

INTEGRATED engineering
1930 Blue Heron Drive
London, ON N6H 5L9
Tel: 519-472-3688
Fax: 519-472-4322
www.integratedengineering.ca

ELECTRICAL DISTRIBUTION PLAN "A"

BB RANCH
ST. WILLIAMS - NORFOLK COUNTY

SCALE: AS NOTED
FILE: 7131
DESIGN: TT DATE: AUG 23
DRWN: TT CHKD: TT

E1 OF 3

PRELIMINARY
NOT FOR CONSTRUCTION

ELECTRICAL DISTRIBUTION
1:500

REVISIONS		
NO	DATE	DESCRIPTION
A	23.08.31	ISSUED FOR REVIEW
B	23.09.28	ISSUED FOR REVIEW
C	23.09.29	ISSUED FOR REVIEW

DO NOT SCALE THE DRAWING

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London, ON N6H 5L9
Tel: 519-472-3688
Fax: 519-472-4322
www.integratedengineering.ca

ELECTRICAL DISTRIBUTION PLAN "B"

BB RANCH
ST. WILLIAMS - NORFOLK COUNTY

SCALE: AS NOTED			
FILE: 7131			
DESIGN: TT	DATE: AUG 23		
DRWN: TT	CHKD: TT		

E2 OF 3

FOR CONTINUATION REFER TO
ELECTRICAL DISTRIBUTION PLAN "A"

02
12
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SEPTIC

8 x 100mm CONCRETE ENCASED LV DUCTS

4 x 100mm CONCRETE ENCASED LV DUCTS

2 x 100mm CONCRETE ENCASED HV DUCTS

HV

P1 P2 P3

S/L

DA ORT NORF

PRELIMINARY
NOT FOR CONSTRUCTION

HIGH-VOLTAGE DISTRIBUTION
1:500

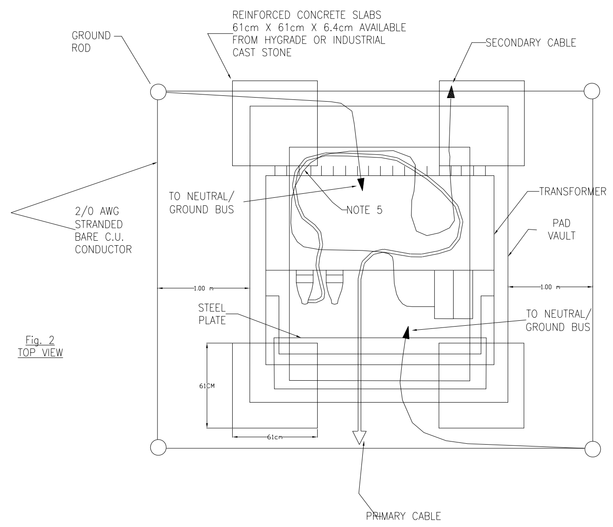
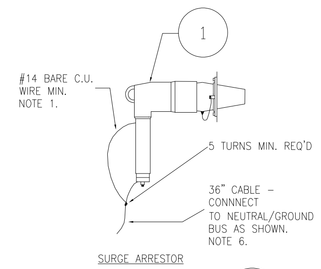
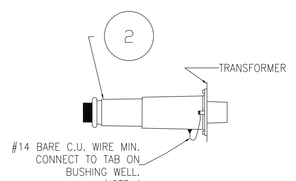


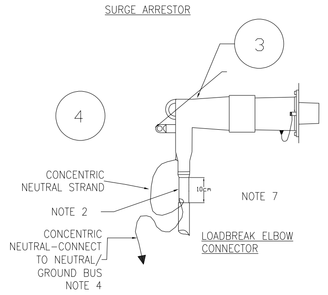
Fig. 2
TOP VIEW



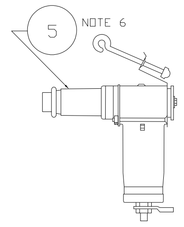
SURGE ARRESTOR



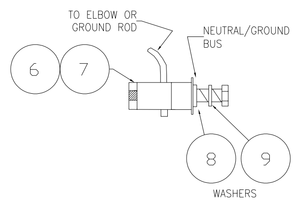
LOADBREAK BUSHING INSERT



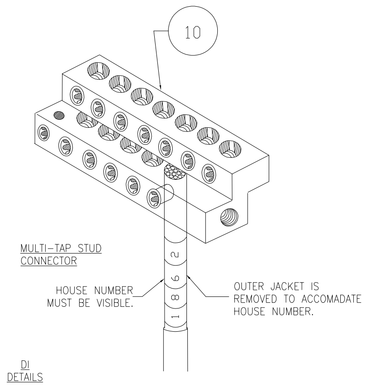
LOADBREAK ELBOW CONNECTOR



PARKING STAND SURGE ARRESTER



VISE GRIP CONNECTOR



DI DETAILS

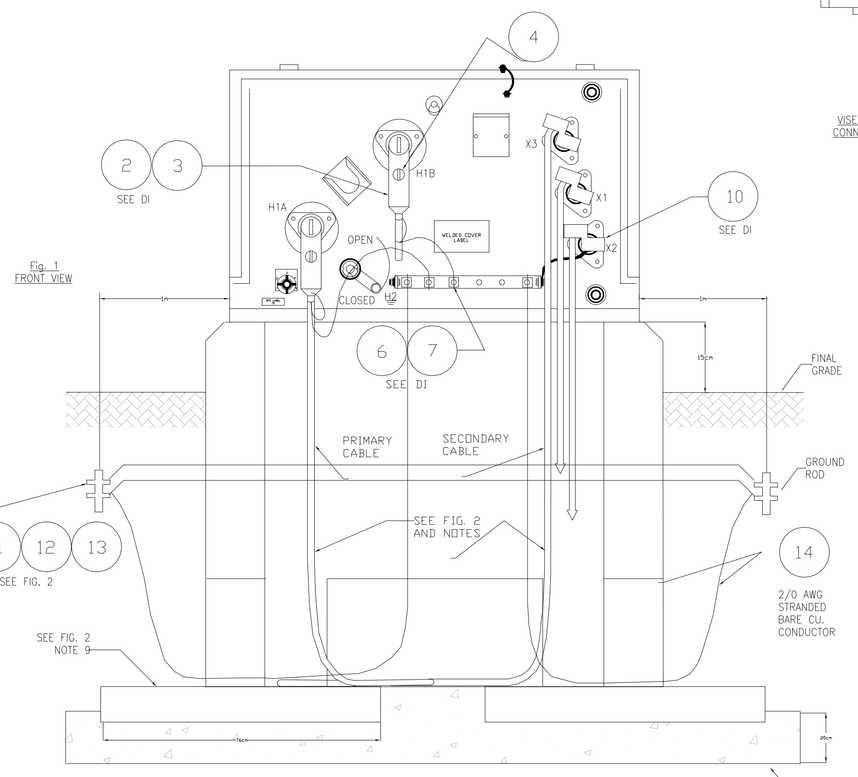


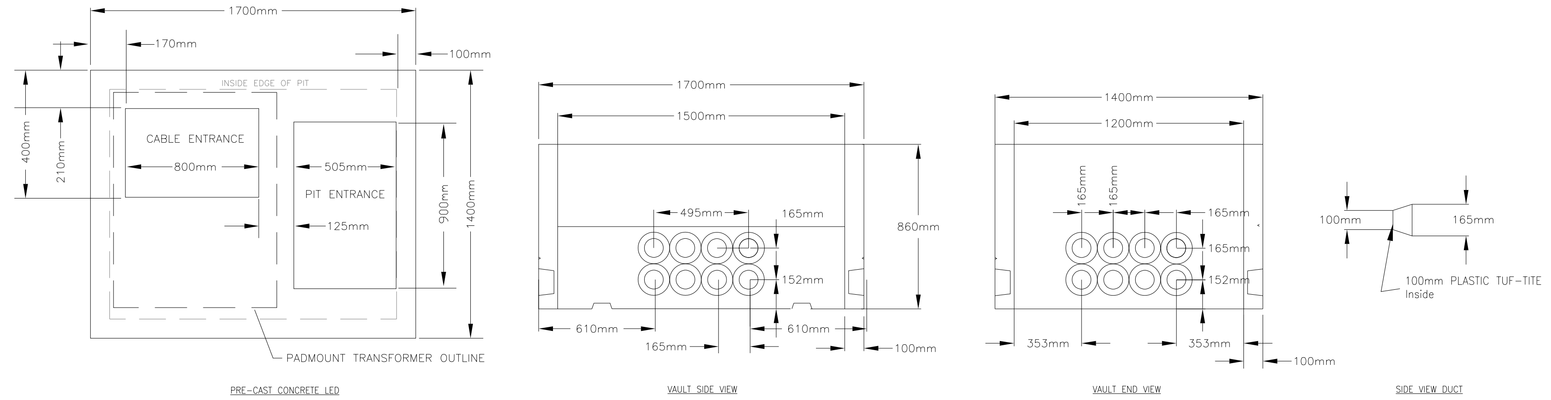
Fig. 1
FRONT VIEW

NOTES

1. USE CONCENTRIC NEUTRAL STRAND FROM DISCARDED SECTION OF U/G CABLE.
2. PEEL BACK CONCENTRIC NEUTRAL EXACTLY 10 CM FROM BASE OF ELBOW.
3. IF REQUIRED, COVER ANY UNUSED LOAD BREAK BUSHING INSERTS WITH ELBOW ARRESTERS.
4. PROVIDE ADEQUATE AMOUNT OF CONCENTRIC NEUTRAL CONDUCTOR TO ALLOW ELBOW TO BE FREELY REMOVED.
5. SUPPLY SUFFICIENT CABLE LENGTH TO PROVIDE FOR LOOP INSIDE PAD VAULT.
6. PARKING STAND ARRESTERS TO BE SUPPLIED AT NORMALLY OPENED POINTS – CONSULT PEN WEST UTILITIES FOR LOCATIONS.
7. CONDUCTORS TO BE MARKED WITH APPROVED COLOURED IDENTIFICATION TAGS TO INDENTIFY PROPER PHASE AND INDICATE CABLE DESIGNATION. CABLE DESIGNATION MUST BE WRITTEN WITH PERMANENT MARKER.
8. STREET LIGHT, BELL, AND CATV GROUND MUST BE CONNECTED DIRECTLY TO NEUTRAL/GROUND BUS.
9. CENTER FOUR REINFORCED CONCRETE SLABS UNDER CORNERS OF PAD VAULT.
10. WHEN INSTALLING TRANSFORMERS LARGER THAN 75KVA THE LARGER STEEL PLATE ON THE TRANSFORMER PAD VAULT MUST BE REMOVED.
11. ALL SINGLE PHASE SUBDIVISION TRANSFORMERS WILL BE 75 KVA, AND ACCOMADATING A MAXIMUM OF TEN CUSTOMERS.

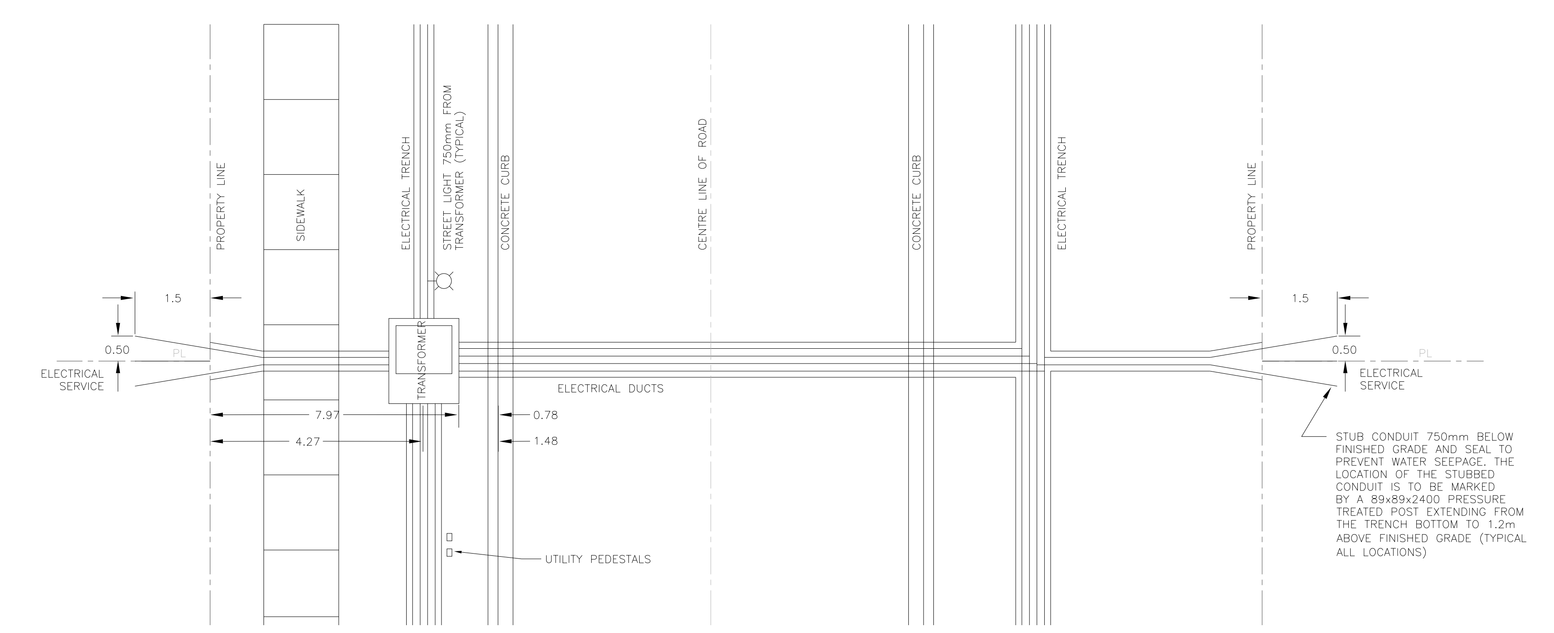
SINGLE PHASE PAD-MOUNT TRANSFORMER

NTS



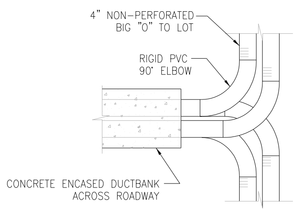
1500 X 1200 mm PRECAST CONCRETE HALF SECTION VAULT

NTS



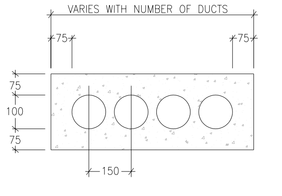
TYPICAL ELECTRICAL ROAD CROSSING DETAIL

NTS



SECONDARY DUCT DETAIL

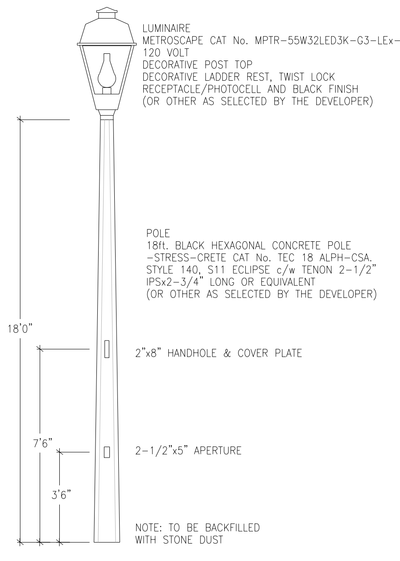
N.T.S.



NOTE:
–ALL DIMENSIONS ARE IN MILLIMETERS
–DUCTS TO BE SAND ENCASED IN BOULEVARDS, CONCRETE ENCASED IN ROADWAYS
–DUCTS TO HAVE 30" COVER IN BOULEVARDS, 36" COVER IN ROADWAYS
–THE ABOVE ARE TYPICAL DUCT CONFIGURATION – FOR ANY VARIATIONS CONTACT FESTIVAL HYDRO

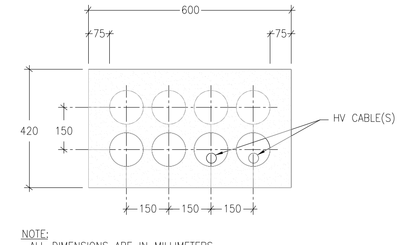
SECONDARY DUCT SECTION

N.T.S.



STREET LIGHT DETAIL

N.T.S.



NOTE:
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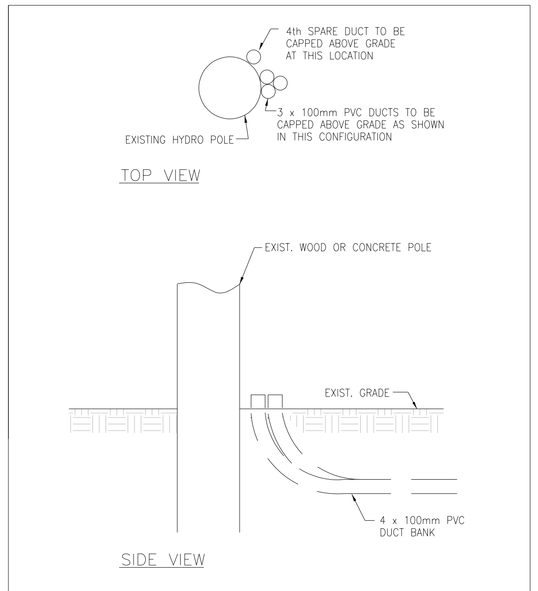
–DUCTS TO HAVE 30" COVER IN BOULEVARDS, 36" COVER IN ROADWAYS
–THE ABOVE ARE TYPICAL DUCT CONFIGURATION – FOR ANY VARIATIONS CONTACT FESTIVAL HYDRO

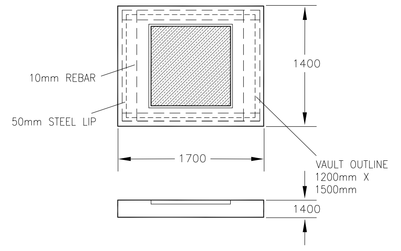
TYPICAL PRIMARY DUCT CONFIGURATION DETAIL

N.T.S.



PVC STUBBED ABOVE GRADE AT A POLE DETAIL

N.T.S.



CHECKER PLATE LID FOR 1200mm X 1500mm VAULT

N.T.S.

1. PROVIDE ALL MATERIAL AND LABOUR FOR A COMPLETE INSTALLATION OF A COMPLETE ELECTRICAL POWER DISTRIBUTION SYSTEMS SHOWN ON THE DRAWINGS AND SPECIFIED HEREIN. THE WORK SHALL BE IN ACCORDANCE WITH THE ONTARIO ELECTRICAL SAFETY CODE, THE ONTARIO BUILDING CODE AND FESTIVAL HYDRO STANDARDS SET FORTH IN THE "SUBDIVISION SERVICING AGREEMENT – ELECTRICAL INSTALLATIONS" (LATEST EDITION).
2. ARRANGE AND PAY FOR ALL PERMITS AND FEES, UPON COMPLETION OF THE WORK PROVIDE AN UNCONDITIONAL CERTIFICATE OF ACCEPTANCE FROM ONTARIO ELECTRICAL SAFETY AUTHORITY.
3. PROVIDE ONLY NEW, CSA APPROVED MATERIAL MOUNTED PARALLEL TO LOT LINES. ALL WORKMANSHIP SHALL BE FIRST–CLASS IN TERMS OF ACCESSIBILITY, DURABILITY AND NEATNESS, EMPLOY QUALIFIED TRADESPERSONS AND OTHER SPECIALIZED TRADES.
4. THE DRAWINGS INDICATE GENERAL DESIGN LAYOUT ONLY. MAKE ALLOWANCES FOR SITE CONDITIONS AND CO–ORDINATION WITH OTHER TRADES. EXAMINE THE SITE AND RELATED DOCUMENTS PRIOR TO TENDER.
5. PROVIDE COPIES OF THE DRAWINGS TO INSPECTION OR SUPPLY AUTHORITIES AS REQUIRED AS PART OF THE PERMIT APPLICATION OR ANY OTHER PURPOSE.
6. ALL MATERIAL SHALL BE AS SPECIFIED IN FESTIVAL HYDRO'S "SUBDISIVION SERVICING AGREEMENT – ELECTRICAL INSTALLATIONS".

ELECTRICAL SPECIFICATIONS

- PADMOUNTED TRANSFORMER
- HYDRO POLE
- LIGHTING POLE
- CONCRETE ENCASED DUCTBANK
- STREET LIGHT WIRING

ELECTRICAL LEGEND

SCALE: AS NOTED
FILE: 7131
DESIGN: TT | DATE: AUG 23
DRAWN: TT | CHKD: TT

E3 OF 3

BB RANCH
ST. WILLIAMS - NORFOLK COUNTY

ELECTRICAL DETAILS

1090 Blue Heron Drive
London, ON N6H 5L9
Tel: 519-472-3488
Fax: 519-472-4322
www.integratedengineering.ca
INTEGRATED engineering

NO	DATE	DESCRIPTION
A	23.08.31	ISSUED FOR REVIEW

REVISIONS

5A-150 Pinebush Road
Cambridge ON N1R 8J8
p: 519.896.3163
905.381.2229
416.479.9684

www.ptsl.com

05 October 2023
Project: 210636

Scott Puillandre
G. Douglas Vallee Ltd.
2 Talbot Street
North Simcoe ON N3Y 3W4

Dear Mr. Puillandre:

RE: BB RANCH, 436 FRONT ROAD, ST. WILLIAMS
TRANSPORTATION IMPACT STUDY

Paradigm Transportation Solutions Limited (Paradigm) completed the Transportation Impact Study (TIS) for the above development in December 2021. The TIS was based on a development proposal for 29 single detached dwelling units, eight tourist cabins, a barn/stable/conference centre for corporate events and weddings, and a pavilion with a kitchen. It is noted that the barn/stable/conference centre building will use the existing barn located on the property.

Vehicular access is proposed via the existing access on Front Road along the western side of the site. An Emergency Access is also provided on Front Road along the northern side of the site.

Figure 1 (attached) illustrates the Concept Site Plan included in the December 2021 TIS.

The Concept Site Plan has since been modified to include one additional single detached dwelling unit, bringing the total to 30 detached dwelling units. The balance of the concept plan is unchanged and includes eight tourist cabins, a barn/stable/conference centre for corporate events and weddings, and a pavilion with a kitchen.

The access arrangement is the same as in the Concept Site Plan in the December 2021 TIS.

Figure 2 (attached) illustrates the new Concept Site Plan.

Traffic Impacts

As noted above, the new Concept Site Plan provides for an additional single detached dwelling unit in comparison to the development statistics in the December 2021 TIS.

Table 1 summarizes the trip generation changes corresponding to the updated Concept Site Plan. The new Concept Site Plan is forecast to generate one additional trip each in the weekday AM and PM and Saturday peak hours. The change in site traffic is considered to be minimal and will not affect the conclusions of the December 2021 TIS.

TABLE 1: UPDATED SITE TRIP GENERATION

Concept Plan	Land Use	Variable	AM Peak Hour				PM Peak Hour				Saturday Peak Hour			
			Rate	In	Out	Total	Rate	In	Out	Total	Rate	In	Out	Total
December 2021	Single-Family Residential - (LUC 210, Single-Family Detached Housing)	29 units	Eq[1]	6	18	**24**	Eq[2]	20	11	**31**	Eq[3]	19	16	**35**
	Tourist Cabins (LUC 320, Motel)	8 units	Eq[4]	4	6	**10**	Eq[5]	7	6	**13**	Eq[5]	7	6	**13**
	Pavilion with Kitchen (LUC 932, High-Turnover (Sit-Down) Restaurant)	1,152 sq. ft.	9.57	6	5	**11**	9.05	6	4	**10**	11.19	7	6	**13**
	Barn/Stable/Conference Centre	20 parking spaces	0	0	0	**0**	1.00	10	10	**20**	1.00	10	10	**20**
Total Trip Generation				**16**	**29**	**45**		**43**	**31**	**74**		**43**	**38**	**81**
Current	Single-Family Residential - (LUC 210, Single-Family Detached Housing)	30 units	Eq[1]	7	18	**25**	Eq[2]	20	12	**32**	Eq[3]	19	17	**36**
	Tourist Cabins (LUC 320, Motel)	8 units	Eq[4]	4	6	**10**	Eq[5]	7	6	**13**	Eq[5]	7	6	**13**
	Pavilion with Kitchen (LUC 932, High-Turnover (Sit-Down) Restaurant)	1,152 sq. ft.	9.57	6	5	**11**	9.05	6	4	**10**	11.19	7	6	**13**
	Barn/Stable/Conference Centre	20 parking spaces	0	0	0	**0**	1.00	10	10	**20**	1.00	10	10	**20**
Total Trip Generation				**17**	**29**	**46**		**43**	**32**	**75**		**43**	**39**	**82**
Net Trip Generation Change				**+1**	**0**	**+1**		**0**	**+1**	**+1**		**0**	**+1**	**+1**

[1]Ln(T) = 0.91 Ln(X) + 0.12
[2]Ln(T) = 0.94 Ln(X) + 0.27
[3]T = 0.86(X) + 9.72
[4]T = 0.28(X) + 7.85
[5]T = 0.24(X) + 11.16

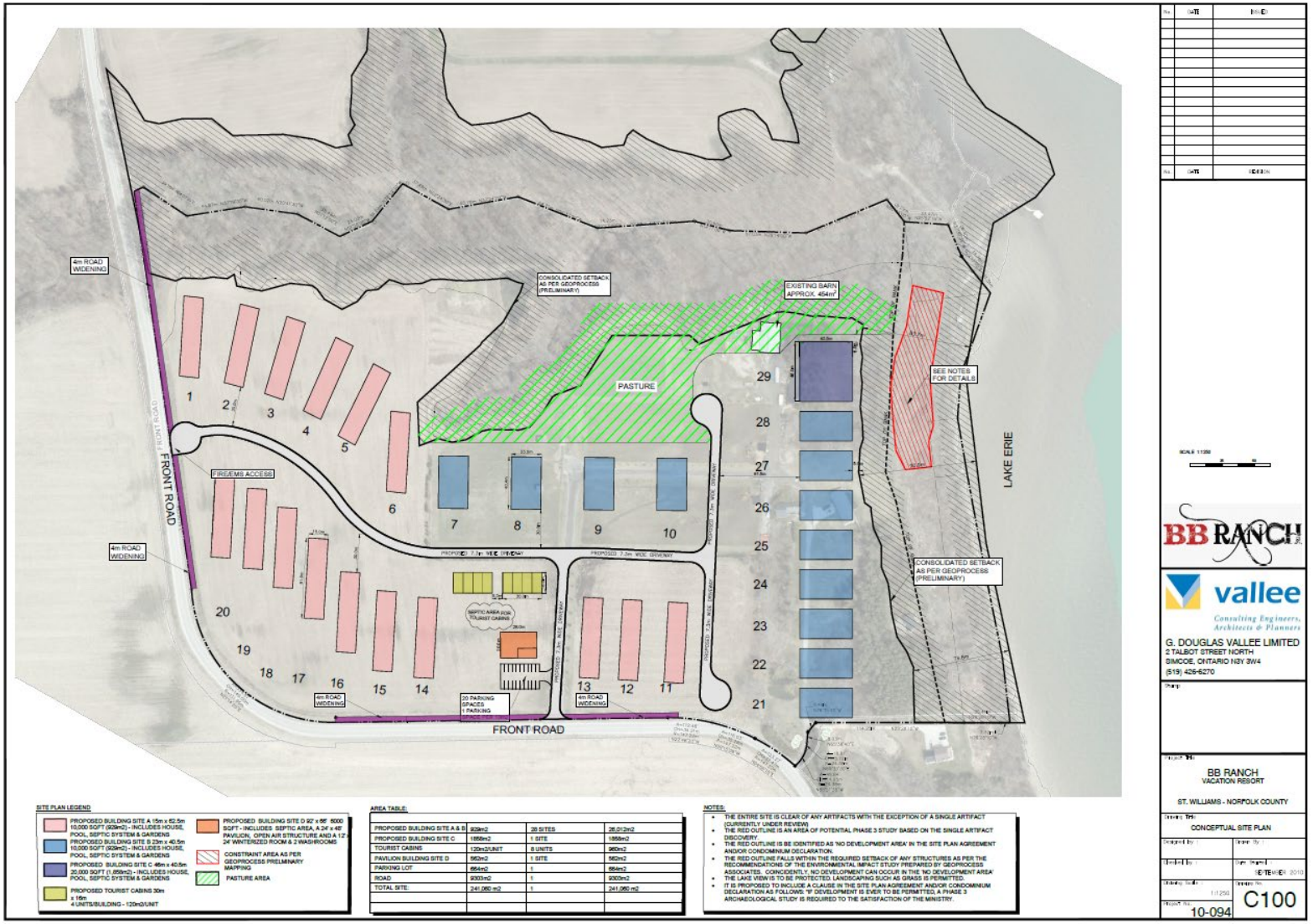
In summary, the findings and conclusions of the Transportation Impact Study completed in December 2021 can be considered as valid for the new Concept Site Plan involving a minor change in the dwelling unit count.

Based on the December 2021 TIS and the above review, we are pleased to recommend that the subject development be considered for approval as proposed.

Yours very truly,

PARADIGM TRANSPORTATION SOLUTIONS LIMITED

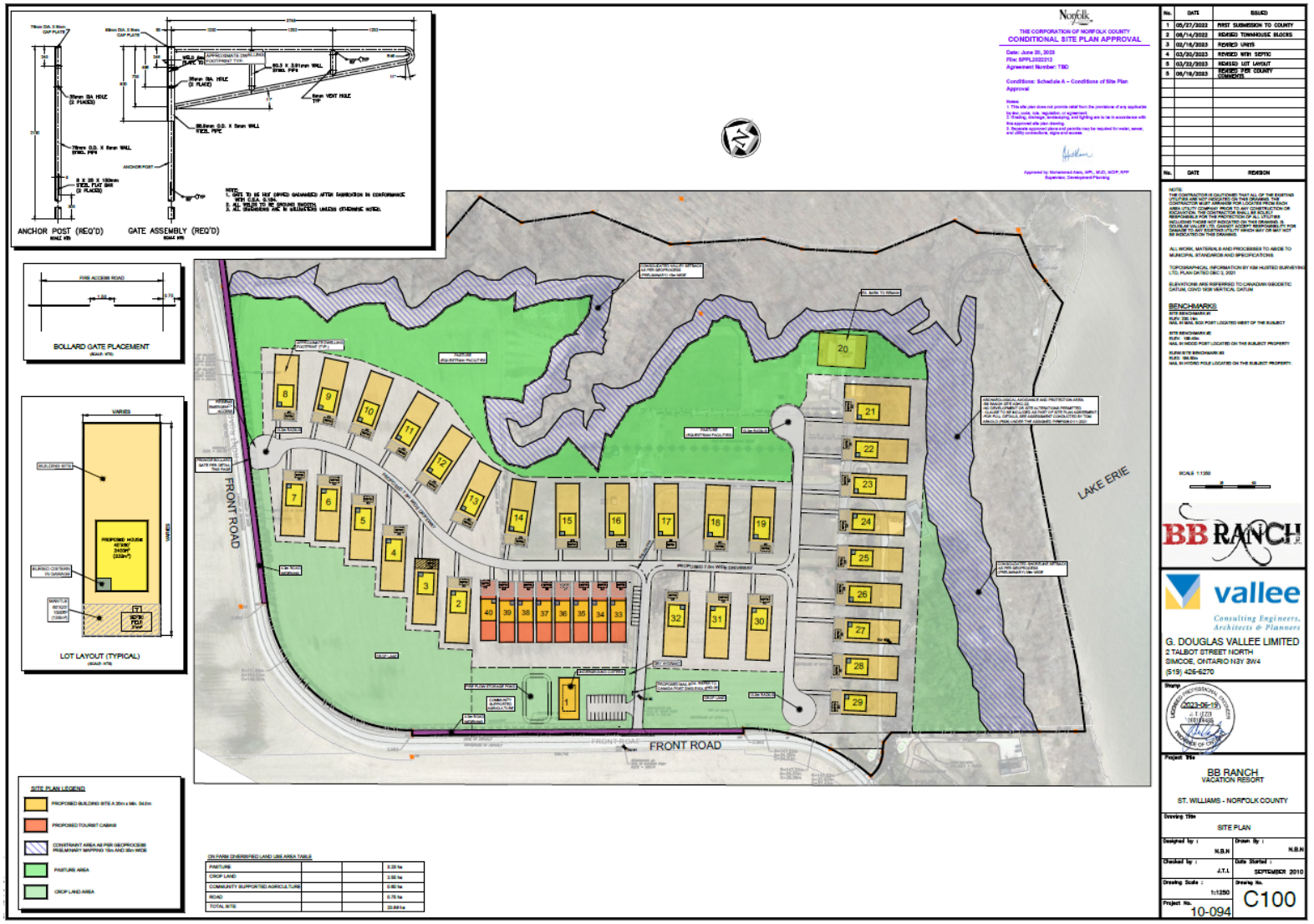
Rajan Philips
M.Sc. (PI), P.Eng.
Senior Transportation Consultant



Concept Site Plan (December 2021 TIS)

436 Front Rd, St. Williams TIS
210636

Figure 1



paradigm TRANSPORTATION SOLUTIONS LIMITED

New Concept Site Plan

436 Front Rd, St. Williams TIS
210636

Figure 2

5A-150 Pinebush Road
Cambridge ON N1R 8J8
p: 519.896.3163
905.381.2229
416.479.9684

www.ptsl.com

07 December 2023
Project: 210636

Scott Puillandre
G. Douglas Vallee Ltd.
2 Talbot Street
North Simcoe ON N3Y 3W4

Dear Mr. Puillandre:

RE: BB RANCH, 436 FRONT ROAD, ST. WILLIAMS
TRANSPORTATION IMPACT STUDY UPDATE – SIGHT DISTANCE REVIEW

Paradigm Transportation Solutions Limited (Paradigm) completed the Transportation Impact Study (TIS) for the above development in December 2021. The TIS was based on a development proposal for 29 single detached dwelling units, eight tourist cabins, a barn/stable/conference centre for corporate events and weddings, and a pavilion with a kitchen. It is noted that the barn/stable/conference centre building will use the existing barn located on the property.

Vehicular access is proposed via the existing access on Front Road along the western side of the site. An Emergency Access is also provided on Front Road along the northern side of the site.

Figure 1 (attached) illustrates the Concept Site Plan included in the December 2021 TIS.

The Concept Site Plan has since been modified to include one additional single detached dwelling unit, bringing the total to 30 detached dwelling units. The balance of the concept plan is unchanged and includes eight tourist cabins, a barn/stable/conference centre for corporate events and weddings, and a pavilion with a kitchen.

The access arrangement is the same as in the Concept Site Plan in the December 2021 TIS.

Figure 2 (attached) illustrates the new Concept Site Plan.

We previously provided an assessment of potential changes in traffic impacts due to Site Plan changes. In our letter dated 05 October 2023, we confirmed that the Site Plan changes will have no implications for the traffic impact assessment undertaken in the December 2021 Transportation Impact Study.

We have since undertaken a sight distance review for the existing driveway to the property on Front Road, which will remain at the same location as part of redevelopment.

The sight distances have been reviewed based on requirements of the TAC Geometric Design Guide for Canadian Roads[1], and measurements using Google Earth mapping.

The site driveway is located on a flat, straight stretch of Front Road between two horizontal curves. To the north, the sight distance is clear to the horizontal curve, and to the south, the visibility goes beyond the curve to the east-west section of Front Road.

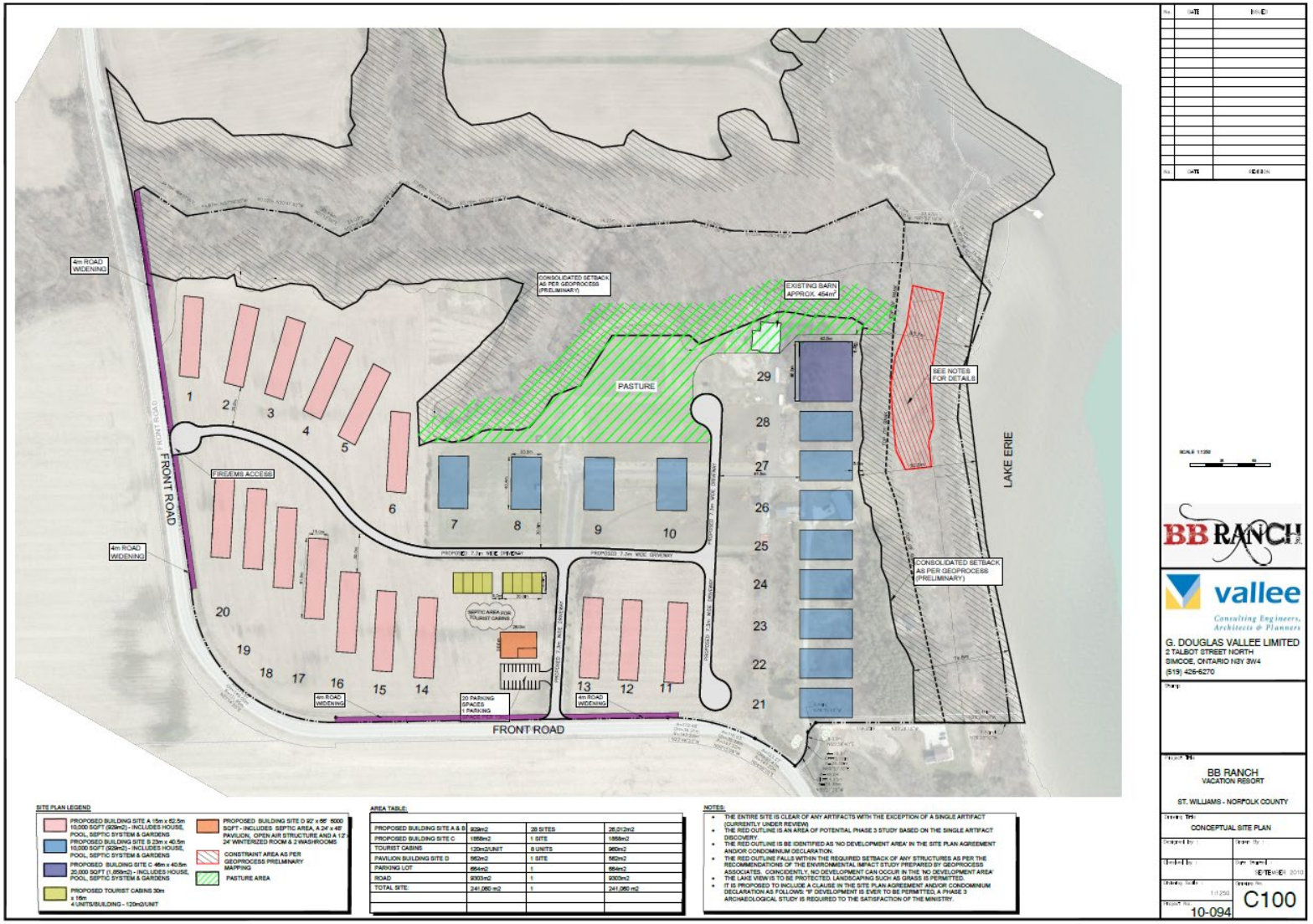
The location of the already existing site driveway is favourable to the visibility in both directions on Front Road. The available sight distances (based on 50 km/h speed, given the posted advisory speed of 30 km/h) are adequate and meet or exceed the required distances of 85 metres (decision sight distance), 110 metres (right turn from stop), and 130 meters (left turn from stop).

Yours very truly,

PARADIGM TRANSPORTATION SOLUTIONS LIMITED

Rajan Philips
M.Sc. (PI), P.Eng.
Senior Transportation Consultant

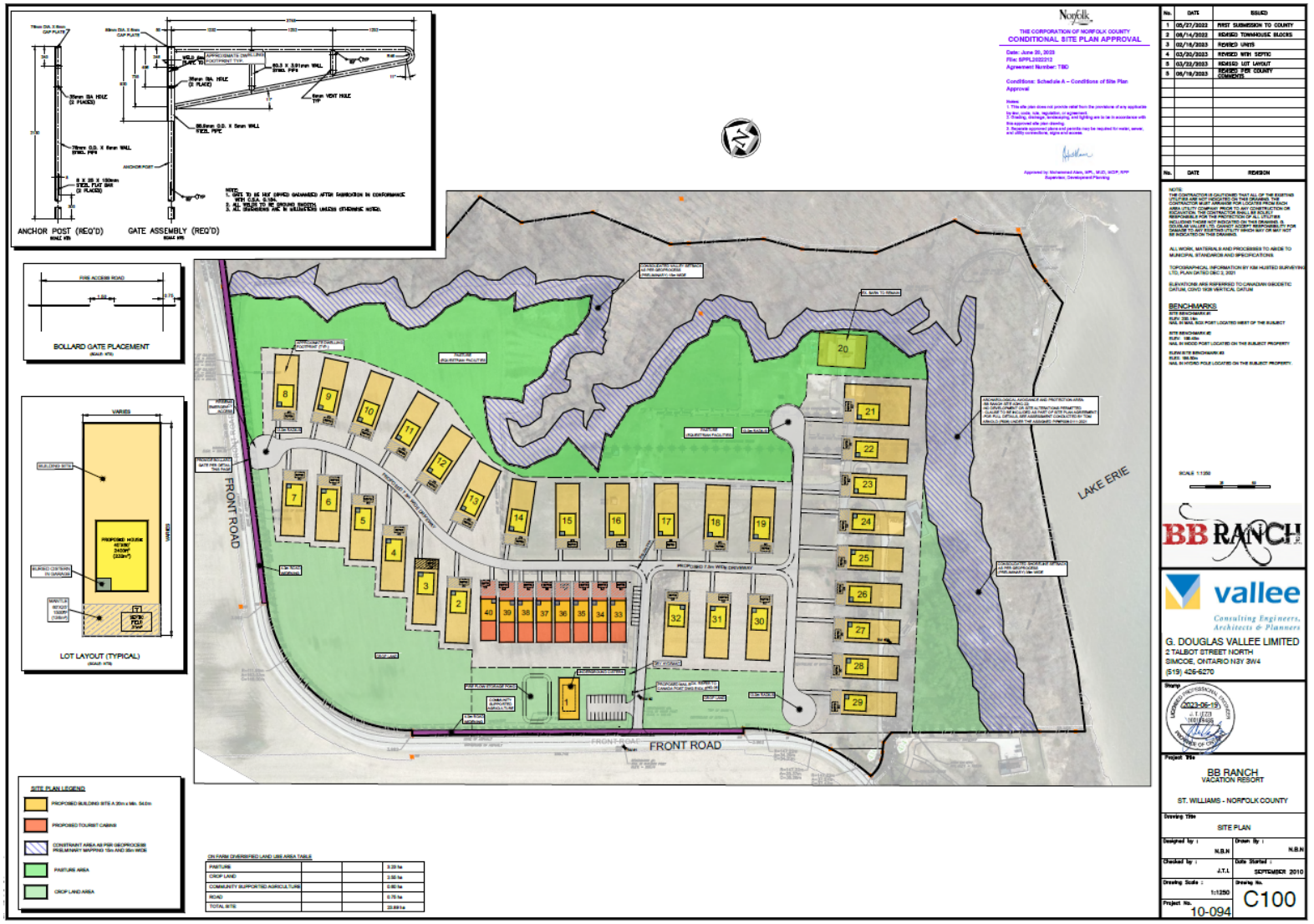
[1] *MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads*, June 2017.



Concept Site Plan (December 2021 TIS)

436 Front Rd, St. Williams TIS
210636

Figure 1



paradigm TRANSPORTATION SOLUTIONS LIMITED

New Concept Site Plan

436 Front Rd, St. Williams TIS
210636

Figure 2

Agreement by Owners - Mutual Agreement Drains

Drainage Act, R.S.O. 1990, c. D.17, s.2

We, the undersigned (hereinafter referred to in this agreement as the owners), enter into this agreement made pursuant to the above *Act* for the construction or improvement and subsequent maintenance of the drainage works for our respective lands as described below:

Property Owners Signing the Mutual Agreement:

- Your municipal tax bill will provide the parcel roll number.
- Complete the following description of the land of each owner sufficient for registration on the title of the property in the proper land registry office.
- Please note that properties registered under *the Registry Act* may be submitted on paper while properties registered under *the Land Titles Act* must be submitted electronically.
- Ensure that each description contains its Property Identification Number (PIN). PINs for municipal roads may require a reference plan.

Contact Information

Last Name	First Name	Middle Initial
BURKO	CHRYSTYNA	

Mailing Address

Unit Number	Street/Road Number	Street/Road Name	PO Box
	5	MORLEY CRT	

City/Town	Province	Postal Code
ETOBICOKE	ONT	M9A 4T8

Lot or Part Lot No.	Concession	Geographic Township	Parcel Roll No.	Property Identification No.
LOTS 21, 22	1	SWAL	543-040-07710-0000	

The Drainage works (*Drainage Act*, R.S.O. 1990,s. (1)) consists of: (Provide brief description of the size, length, and location of the drainage works)
An established stormwater outlet exists on the property at 436 Front Road which conveys stormwater from the property at 436 Front Road, through 434 Front Road and outlets at Lake Erie. This outlet consists of a catchbasin inlet, approx. 35m of 450mm storm sewer which releases to a vegetated ravine and conveys flows to Lake Erie.

The drainage works is located as shown on the attached plan which forms part of this agreement. (The plan must show the parcel boundaries and the location of the drain, giving points of commencement, course and termination, depth, bottom and top width, any bridge, culverts, catch basin, etc., requested and other particulars as agreed upon.) Illegible plans will not be accepted.

The name of the drainage works (optional)

The estimated cost of the drainage works $0.00 **(dollars)**

The proportion of the cost of construction or improvement and subsequent maintenance of the drainage works shall be borne by the owners of the undersigned properties in the proportions set out opposite each property:

Express the proportion under each heading as a percentage. The total of the percentages in each column must add up to 100.

Property Identification No.	Construction/Improvement %	Maintenance %
Total 100%		

Additional terms to the agreement as specified by the owners (i.e. Timeframe required for maintenance)

Registered agreement binding on successors

In accordance with section 2(3) of the *Drainage Act*, an agreement or an executed copy thereof made under this section shall, upon registration in the proper land registry office, be binding upon the heirs, executors, administrators, successors and assigns of each party to the agreement.

X I hereby enter into this agreement for drainage for the land described and acknowledge my financial obligations.(Fill out the applicable section below)

Ownership

☑ Sole ownership

Owner Name (Last Name,First Name) (Type/Print)	Signature	Date (yyyy/mm/dd)
CHRYSTYNA BURKO		1991/05/05 BD 2023/10/20 Date of Signing

☐ Partnership (Each partner in the ownership of the property must sign the agreement form)

Owner Name (Last Name,First Name) (Type/Print)	Signature	Date (yyyy/mm/dd)

☐ Corporation (The individual with authority to bind the corporation must sign the agreement form)

Name of Signing Officer (Last Name, First Name) (Type/Print)

Name of Corporation	Signature I have the authority to bind the Corporation
Position Title	Date (yyyy/mm/dd)

I hereby enter into this agreement for drainage for the land described and acknowledge my financial obligations.(Fill out the applicable section below)

Ownership

☐ Sole ownership

Owner Name (Last Name,First Name) (Type/Print)	Signature	Date (yyyy/mm/dd)

☑ Partnership (Each partner in the ownership of the property must sign the agreement form)

Owner Name (Last Name,First Name) (Type/Print)	Signature	Date (yyyy/mm/dd)
Rebecca Bouck		~~Oct~~ 2023/10/20
Robb Bouck		2023/10/20
Ashley Bouck		2023/10/20
Aaron Shurr		2023/10/20
Elle Shurr		2023/10/20

☐ Corporation (The individual with authority to bind the corporation must sign the agreement form)

Name of Signing Officer (Last Name, First Name) (Type/Print)

Name of Corporation	Signature I have the authority to bind the Corporation
Position Title	Date (yyyy/mm/dd)

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Owner Name (Last Name,First Name) (Type/Print)	Signature	Date (yyyy/mm/dd)

☐ Corporation (The individual with authority to bind the corporation must sign the agreement form)

Name of Signing Officer (Last Name, First Name) (Type/Print)

Name of Corporation	Signature I have the authority to bind the Corporation
Position Title	Date (yyyy/mm/dd)

Ontario

October 20, 2023

To: To Whom it may concern - Norfolk County

By way of this letter, I am confirming there is a drainage tile that crosses our property at 434 Front Rd, St Williams. This drainage line has been crossing the property since we purchased it.

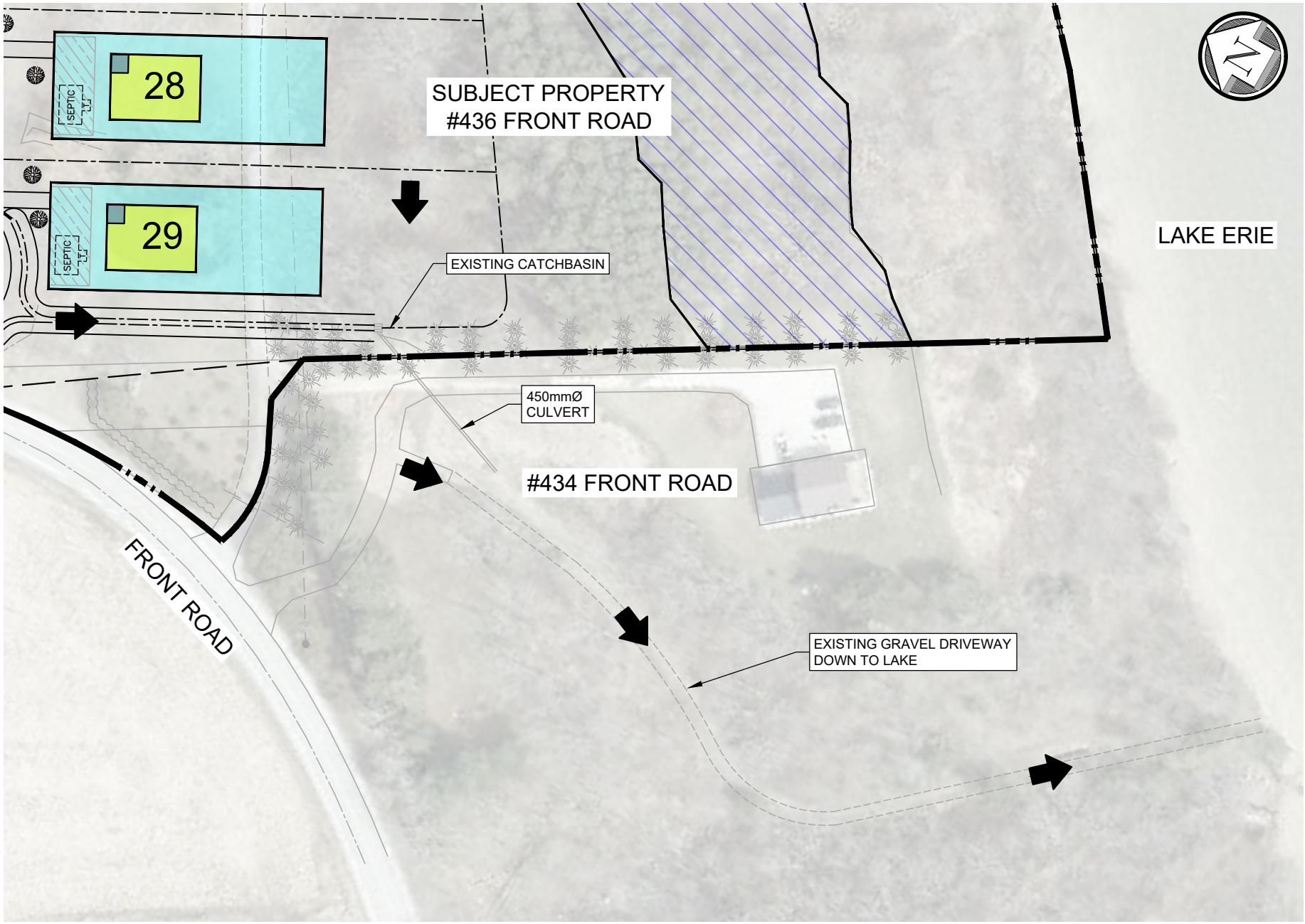
With the natural grades of all the adjoining properties, it's quite possibly been this way for hundreds of years.

It appears the tile and all drainage coming from 436 Front Road is working properly with no issues.

If you have any further questions please feel free to contact me at 416-475-4574 or vlad@vbgroup.ca .

Best regards,

Volodymyr Burko



STORMWATER OUTLET B

Long Point Region Conservation Authority

4 Elm St., Tillsonburg ON N4G 0C4 Tel: (519) 842-4242 Fax: (519) 842-7123
Email: conservation@lprca.on.ca Website: www.lprca.on.ca

Norfolk County
50 Colborne St S,
Simcoe, ON
N3Y 4H3

September 19, 2023

Attention: Mohammad Alam

Long Point Region Conservation Authority (LPRCA) staff have had an opportunity to review the application SPPL2022212 and can provide the following comments based on LPRCA's various plan review responsibilities for Norfolk County's consideration.

It is staff's understanding that the submitted application will facilitate an Equestrian Resort and Tourist Accommodations.

Conditions for Site plan

To be Satisfied Prior to Site Plan Agreement:

AND FURTHER THAT prior to final plan approval, the Owner shall complete, submit and carry out the recommendations and any necessary mitigation to the satisfaction of the Long Point Region Conservation Authority from the following reports and plans:

a. A detailed Stormwater Management Plan and report including:

    i. Legal and adequate outlet for stormwater;

b. A detailed Sediment and Erosion Control Plan;

c. A detailed Grading Plan.

To Be Satisfied Prior to Grading:

AND FURTHER THAT the Owner shall, prior to any site alteration, secure any permits required under the Conservation Authorities Act, R.S.O. 1990, c. C.27, from the Long Point Region Conservation Authority.

A permit is required for any development as listed below on the subject property:

- the construction, reconstruction, erection or placing of a building or structure of any kind,
- any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure,
- site grading, or
- the temporary or permanent placing, dumping or removal of any material, originating on the site or elsewhere (Conservation Authorities Act, R.S.O. 1990, c. 27, s. 28 (25)).

Further Comments

LPRCA staff have reviewed the following studies:

- Site and Engineering plans, by G. Douglas Vallee Limited (2023-07-07)
- Functional Servicing Report, by G. Douglas Vallee Limited (2023-07-07)
- Stormwater Management Report, by G. Douglas Vallee Limited (2023-07-07)
- Comment Response Matrix, by G. Douglas Vallee Limited (2023-07-07)

LPRCA staff have reviewed these studies and reports and can offer the following information on the requirements to be met under Ontario Regulation 178/06.

1. A pre and post development flow comparison is expected in the final report. The flows should be dictated based on a quantitative analysis.
2. LPRCA is concerned that outlet A is not a legal outlet. From the drawings provided it does not appear to be within the property limits. If this is not a legal outlet, a different concept will need to be considered.
3. The Geotechnical engineer who analyzed the slope and wrote the geotechnical report for this site should review the storm water management concept and provide design recommendations for the proposed outlets.
4. Even though the post development flows will be reduced below predevelopment flow rates, the changes in grades will result in an increase in concentration of these flows down these specified outlets. Special attention to erosion prevention should be made with the help of the Geotechnical engineer.

Sincerely,

Isabel Johnson, Resource Planner
Long Point Region Conservation Authority
4 Elm Street, Tillsonburg, ON. N4G 0C4
519-842-4242 ext. 229.

Jane Zilke, Certified Nutrient Management Consultant
616378-13th Line, RR 6
Woodstock, Ontario
N4S 7W1

October 19, 2023

To Whom it May Concern:

I am writing to acknowledge that Mr. Jeff Bouck has contacted myself to inquire about a Nutrient Management Strategy for his property at 436 Front Rd., St. Williams, Ontario.

After some consideration and processing of information, I have concluded that Mr. Bouck should not require a Nutrient Management Strategy for the following reasons:

> A Nutrient Management Strategy is required on operations when the total Nutrient Units of all livestock that is housed on the farm unit is more than 5 Nutrient Units of manure produced annually - O. Reg. 338/09, s. 6 (1)

According to the attached-AgriSuite print out (OMAFRA software), the total Nutrient Units for Mr. Bouck's operation is 5 Nutrient Units; thereby not requiring a Nutrient Management Strategy. There is no construction of livestock housing nor manure storage being proposed either.

If you should have any further questions or concerns regarding this matter, I can be reached at (519) 462-1443 or by email at: jjzilke@cwisp.ca

Sincerely,

Jane Zilke

Jane Zilke
Certified Nutrient Management Consultant

Ontario

AgriSuite

Nutrient management strategy (Fall 2023 - Fall 2024)

General information

Please ensure you retain a copy of the completed NM Strategy (and NM Plan, if applicable) for your records. It is your responsibility to keep copies of the documents that comprise your approved NMS. You will be contacted by OMAFRA staff if you are required to provide additional information during the review process. You are required to update the NM Strategy and to keep it on file and available for inspection, if requested.

This document is missing required information

Reason for submission

This document has been prepared for approval .
Other : Not constructing livestock housing nor manure storage

Preparer information

Preparer
Jane Zilke
(AOSPDC19346)

Contact details
616378-13TH LINE RR 6
Woodstock , ON , Canada N4S 7W1
519-462-1443
jjzilke@cwisp.ca

Agricultural operation information

Operator contact information
Jeff Bouck
436 Front Rd.
St. Williams, ON
N0E 1P0
519-865-3030
jeff@bouckinc.com

Owner is the same as the operator
Yes

Operation type
Corporation

Legal farm name

Federal business number
NA (Not available)

Nutrient management strategy summary

Total nutrient units (this farm unit)
5 NU

Total tillable area
70 ac

Non-NMA transfer area
0 ac

Previous NASM or NMS submission IDs
None (None)

Statements

- Municipal well(s) do not exist within 100 m of the farm unit ✓
- A NMP hasn't been required for this farm unit in the past ✓
- A NMP is not required for this farm but recommended as a BMP ✓

Storage groups with less than 240 days of storage

- None (None)

New/expanding storages that require engineering

- None (None)

Storages that require runoff management

- None (None)

Farm unit summary

New farm

This farm
- Generates ASM
- Receives ASM
- Receives commercial fertilizer

Status
Owned

Tillable area
20 ac

Farm location

Roll numbers

911 address (if available)

Storage system summary

BB Ranch

Start/end date
Sep, 2023- Aug, 2028 (5 years)

Total nutrient units
5 NU

Source Material

Horses (5, Horses, Medium Frame (including unweaned offspring), Box Stalls)

Average weight
1000 lb

Total utilization
100 %

Nutrient units
5 NU

Estimated livestock barn area
1250 ft²

Pasture
25 GU

Flag summary

Legal Farm Name (BB Ranch/Jeff Bouck MSTOR)
The legal farm name has not been entered.

Overview of Operation (BB Ranch/Jeff Bouck MSTOR)
Required information has not been entered.

Federal Business Number (BB Ranch/Jeff Bouck MSTOR)
The federal business number (or reason for exemption) must be specified.

ASM Generating Lot (New farm)
The ASM generating lot(s) have not been specified. Add / specify the lot(s) on this farm that generate ASM.

Location Information (New farm)
Location information has not been specified.

Roll Number Information (New farm)
Roll number(s) have not been entered.

Peto MacCallum Ltd.
CONSULTING ENGINEERS

December 04, 2023

PML Ref.: 21HF036
Report: 2

Mr. Jeff Bouck
BB Investments Ltd.
436 Front Road
St. Williams, Ontario
N0E 1P0

Dear Mr. Bouck

Geotechnical Review of
Stormwater Drainage Features
BB Ranch Vacation Resort
436 Front Road
St. Williams, Ontario

As requested, Peto MacCallum Ltd. (PML) has completed a review of the geotechnical aspects of the proposed stormwater management concept for the above project. This review is supplementary to, and should be read in conjunction with, our previous Geotechnical Investigation, PML Reference 21HF036, Report 1 dated April 25, 2022.

The following documents were reviewed:

1. Drawing C101, Grading and Servicing Plan, by G. Douglas Vallee Limited, Project No. 10-094 dated January 202, Revision 2 dated July 6, 2023 (Dwg. C101)
2. Drawing C102, Erosion and Sediment Control Plan, by G. Douglas Vallee Limited, Project No. 10-094 dated May 2022, Revision 2 dated July 6, 2023 (Dwg. C102)
3. Stormwater Management Report, BB Ranch Vacation Resort, St. Williams, Norfolk County, by G. Douglas Vallee Limited Project # 10-094 dated July 7, 2023 (SWM Report)
4. Long Point Region Conservation Authority Letter to Norfolk County, Re: Conditions for Site Plan, dated September 19, 2023 (LPRCA Letter)
5. Memo from G. Douglas Vallee Limited dated November 1, 2023 Re: Outlet Erosion Protection, BB Ranch Vacation Resort, St. Williams – Norfolk County (GDV Memo) - enclosed for reference.

The purpose of the review was to check for potential impacts of the proposed drainage concept on the geotechnical aspects of the site and in particular, the stability of the slopes on the south and northeast areas of the site. The review is in response to comments 3 and 4 from the September 19, 2023 LPRCA Letter, which are restated below for ease of reference.

3. *The Geotechnical engineer who analyzed the slope and wrote the geotechnical report for this site should review the storm water management concept and provide design recommendations for the proposed outlets.*
4. *Even though the post development flows will be reduced below predevelopment flow rates, the changes in grades will result in an increase in concentration of these flows down these specified outlets. Special attention to erosion prevention should be made with the help of the Geotechnical engineer.*

General Review Comments

Pre-development Condition

For the predevelopment condition (SWM Report, FIG2) the site has two drainage areas plus one external drainage area. The north portion of the site generally drains by sheet flow towards the ravine on the north side of the site. The southcentral area of the site drains generally towards the slopes in the southeast corner of the site and to an existing rip-rap lined drainage ditch and gravel roadway identified as 'Outlet A' which conveys the drainage down the slope to Lake Erie. The west portion of the site drains by sheet flow toward the west boundary of the site and towards an existing catchbasin and 450 mm diameter culvert identified as 'Outlet B'. The culvert outlets to an off-site drainage gully/road cut just beyond the southwest corner of the site at 434 Front Road. The existing drainage gully/road cut is well vegetated with relatively dense vegetation and mature trees and there is no evidence of significant active erosion. This existing drainage feature ultimately conveys stormwater down the slope to Lake Erie. Photographs of the Outlet A and B drainage features are enclosed.

Post-Development Condition

The proposed post-development drainage concept (SWM Report, FIG3) is divided into nine SWM drainage areas plus one external drainage area ranging in size from 0.56 to 2.6 ha. In this concept the external drainage area conveying sheet flow to the east ravine is reduced. The remaining drainage areas direct stormwater flows to the existing Outlets A and B. No new outlets are indicated. As per the SWM Report, the 100-year design stormwater flows to Outlets A and B are 0.754 m3/s and 1.142 m3/s, respectively with corresponding flow velocities of 0.64 m/s and 0.92 m/s, respectively.

Review Comments

Overall Slope Stability

Based the information provided in the SWM Report and considering the subsurface soil and ground water conditions at the site, the ground water levels in the vicinity of the slopes are not expected to change significantly between the pre-development and post-development conditions. As such, it is our opinion that the proposed drainage concept will not negatively impact the overall stability of the slopes with respect to potential deep-seated slope failure caused by elevated ground water levels or active seepage.

Outlets A and B

The existing drainage outlets (Outlets A and B), which currently convey drainage down the slopes to Lake Erie, are proposed to be maintained and no new outlets are contemplated. Based on site observations, there are currently no significant active erosion features or slope stability concerns in connection with these outlets.

We agree with the GDV Memo that the existing rip-rap erosion protection provided in the drainage ditch downstream of Outlet A (Photos 1 and 2) is adequate to resist the reported 100-year flow and flow velocity. Provided that this rip-rap erosion protection is adequately maintained, we do not anticipate any negative impacts with respect to slope stability and/or erosion.

For Outlet B, the existing drainage gully downstream of the culvert is well vegetated without any evidence of significant active erosion under the current pre-development conditions (Photos 3 and 4). The flow velocities downstream of the culvert under the 100-year storm event are expected to be similar to that of the swales immediately upstream of the culvert with a calculated

flow velocity of 0.92 m/s. Grass and vegetation downstream of the culvert can be expected to be stable (resistant to erosion) under flow velocities of less than about 1.2 m/s.

Internal Drainage Swales

We agree that the proposed grass lined drainage swales throughout the proposed development will be sufficient to resist the calculated flow volumes and flow velocities of less than 1.2 m/s as outlined in the GDV SWM Report. No additional erosion protection measures are required.

Routine maintenance of all drainage features is recommended as per accepted best management practices.

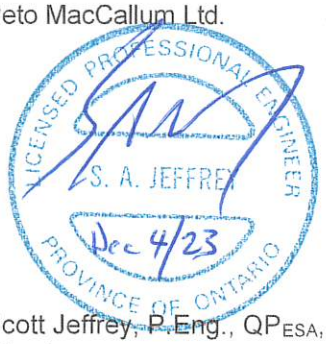
Closure

We trust this report has been completed within our terms of reference and is sufficient for your current needs.

Should you have further questions, please do not hesitate to contact our office.

Sincerely,

Peto MacCallum Ltd.



Scott Jeffrey, P.Eng., QP_{ESA}, $LEED_{GA}$
Director
Regional Manager, Geotechnical and Geoenvironmental Services

SJ:ld

Enclosures:
Photographs of Outlets A and B
GDV Memo dated November 1, 2023

Photo 1: Downstream of Outlet A looking up the slope showing existing riprap lined drainage channel

Photo 2: Downstream of Outlet A looking towards Lake Erie

Photo 3: Outlet B, immediately downstream of the existing 450 mm diameter culvert

Photo 4: Existing gully/pathway downstream of Outlet B, looking towards Lake Erie

vallee

Consulting Engineers,
Architects & Planners

To: Scott Jeffrey
Peto MacCallum Ltd. Consulting Engineers

From: John Iezzi, P. Eng., Natalie Biesinger, E.I.T.

Date: November 1, 2023

Re: Outlet Erosion Protection
BB Ranch Vacation Resort
St. Williams – Norfolk County
Our File 10-094

G. Douglas Vallee Limited has reviewed the comments submitted by the Long Point Region Conservation Authority (LRPCA) for Site Plan application SPPL2022212. Refer to the comments attached to this memorandum. Per comments 3 and 4, it was required that the geotechnical engineer for the proposed development review and comment on erosion protection at the proposed stormwater outlets. This memo presents the erosion protection at the stormwater outlet at the southeast corner of the property, referred to as Outlet A throughout this memo.

As described in the detailed Stormwater Management Report completed by G. Douglas Vallee, Outlet A consists of an existing 0.35m deep by 1.2 wide rip-rap trench, and a 2.5m wide gravel access road leading down to the shoreline of Lake Erie. Prior to discharging to Lake Erie, stormwater will confluence at an existing 2.0m wide rip-rap channel, which then releases to the lake. Table 1 presents the outlet channel geometry, the maximum channel capacity, and the peak 100-year flow rate experienced at Outlet A.

Table 1
Outlet A Geometry and Capacity

Channel Bottom Width	1.25m
Channel Depth	0.25m
Channel Side Slopes	1.5:1
Channel Slope	3.0%
Channel Capacity	0.77 m^3/s
100-Year Flow Rate	0.75 m^3/s

As presented above, it can be concluded that the existing rip-rap channel provides adequate capacity to convey the peak 100-year flow rate to Lake Erie.

To ensure the existing rip-rap channel is adequately sized to prevent erosion, Vallee conducted rip-rap sizing calculations in accordance to the *MTO Drainage Management Manual (1997)* Guidelines. Table 2 presents the analysis findings.

Table 1 Outlet A Rip-Rap Sizing	
Bottom Shear Stress	71 N/m^2
Side Slope Shear Stress	29 N/m^2
Median Rip-Rap Size	150mm
Bottom Shear Resistance	94 N/m^2
Side Shear Resistance	53 N/m^2

Based on the shear stresses, and shear resistances presented above, it can be concluded that the existing 150mm rip-rap channel is adequately sized to prevent erosion during storm events up to and including the 100-year design storm event. Refer to the complete calculations attached to this memo.

It is recommended that this memo be reviewed by the geotechnical engineer in support of the site plan application for the proposed development.

We trust that this information is complete and sufficient for submission. Should you have any questions or require further information please do not hesitate to contact us.

Respectfully submitted,

Natalie Biesinger, E.I.T.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects & Planners

LICENSED PROFESSIONAL ENGINEER
J. T. IEZZI
100189485
PROVINCE OF ONTARIO

John Iezzi, P. Eng.
G. DOUGLAS VALLEE LIMITED
Consulting Engineers, Architects & Planners

Attachments:

1) LRPCA Conditional Approval Comments
2) Outlet A Rip-Rap Calculations

H:\Projects\2010\10-094 At Play St. Williams Resort\3-Design\SWM\Erosion Protection Memo\2023.11.01 10094 Erosion Memo.docx

Long Point Region Conservation Authority

4 Elm St., Tillsonburg ON N4G 0C4 Tel: (519) 842-4242 Fax: (519) 842-7123
Email: conservation@lprca.on.ca Website: www.lprca.on.ca

Norfolk County
50 Colborne St S,
Simcoe, ON
N3Y 4H3

September 19, 2023

Attention: Mohammad Alam

Long Point Region Conservation Authority (LPRCA) staff have had an opportunity to review the application SPPL2022212 and can provide the following comments based on LPRCA's various plan review responsibilities for Norfolk County's consideration.

It is staff's understanding that the submitted application will facilitate an Equestrian Resort and Tourist Accommodations.

Conditions for Site plan

To be Satisfied Prior to Site Plan Agreement:

AND FURTHER THAT prior to final plan approval, the Owner shall complete, submit and carry out the recommendations and any necessary mitigation to the satisfaction of the Long Point Region Conservation Authority from the following reports and plans:

a. A detailed Stormwater Management Plan and report including:

    i. Legal and adequate outlet for stormwater;

b. A detailed Sediment and Erosion Control Plan;

c. A detailed Grading Plan.

To Be Satisfied Prior to Grading:

AND FURTHER THAT the Owner shall, prior to any site alteration, secure any permits required under the Conservation Authorities Act, R.S.O. 1990, c. C.27, from the Long Point Region Conservation Authority.

A permit is required for any development as listed below on the subject property:

- the construction, reconstruction, erection or placing of a building or structure of any kind,
- any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure,
- site grading, or
- the temporary or permanent placing, dumping or removal of any material, originating on the site or elsewhere (Conservation Authorities Act, R.S.O. 1990, c. 27, s. 28 (25)).

Further Comments

LPRCA staff have reviewed the following studies:

- Site and Engineering plans, by G. Douglas Vallee Limited (2023-07-07)
- Functional Servicing Report, by G. Douglas Vallee Limited (2023-07-07)
- Stormwater Management Report, by G. Douglas Vallee Limited (2023-07-07)
- Comment Response Matrix, by G. Douglas Vallee Limited (2023-07-07)

LPRCA staff have reviewed these studies and reports and can offer the following information on the requirements to be met under Ontario Regulation 178/06.

1. A pre and post development flow comparison is expected in the final report. The flows should be dictated based on a quantitative analysis.
2. LPRCA is concerned that outlet A is not a legal outlet. From the drawings provided it does not appear to be within the property limits. If this is not a legal outlet, a different concept will need to be considered.
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Sincerely,

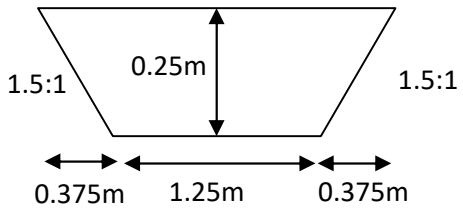
Isabel Johnson, Resource Planner
Long Point Region Conservation Authority
4 Elm Street, Tillsonburg, ON. N4G 0C4
519-842-4242 ext. 229.

vallee
Consulting Engineers, Architects & Planners

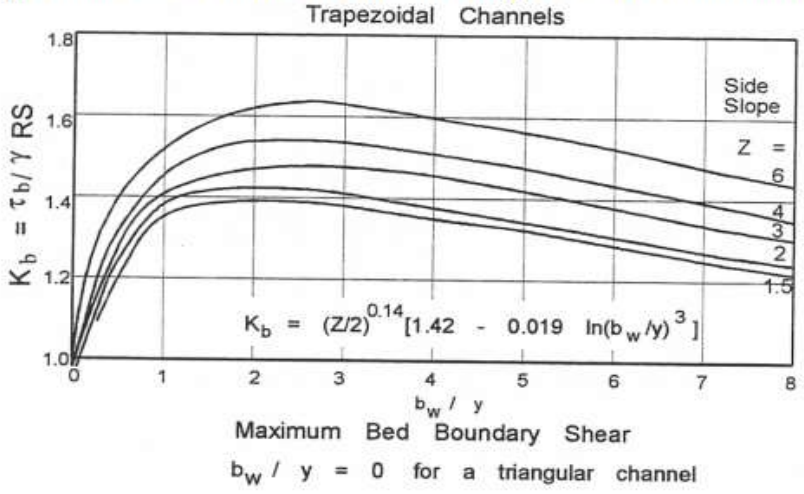
Subject:	Outlet A Rip-Rap Calculations		
Date:	10/30/2023	By:	NLB
Project #:	10-094	Page	

Outlet A Rip-Rap Calculations

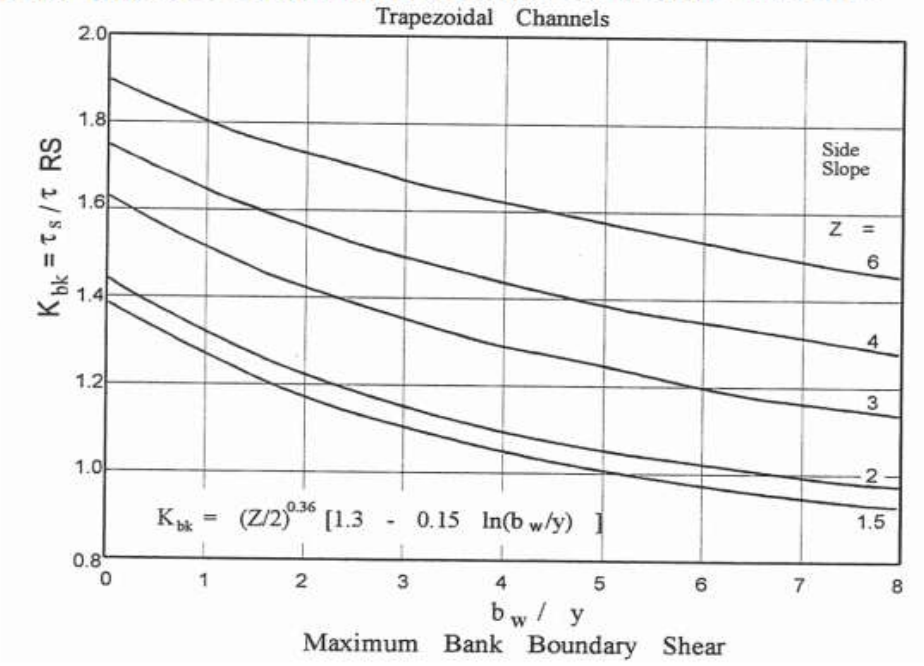
10-Year Peak Flow	**0.380**	**m3/s**	
100-Year Peak Flow	**0.754**	**m3/s**	
Bottom Width (bw)	1.25	m	top width = 2.00 m
Depth (y)	0.250	m	
bw/y	5.0		
Side Slopes (Z)	1.5	:1	
Cross-Sectional Area of Flow	0.41	m2	
Wetted Perimeter	2.15	m	
Hydraulic Radius	0.19	m	
Slope	0.03	m/m	
Manning's n (Rip-Rap)	0.03		
100-Year Peak Flow	**0.772**	**m3/s**	
Velocity	**1.90**	**m/s**	
Mean Boundary Shear Stress (τ_o)	55.57	N/m2	
Kbottom	1.28		MTO Design Chart 2.11
Shear Bottom (τ_b)	**71**	**N/m2**	
Kbank	0.52		MTO Design Chart 2.12
Shear Bank Sides (τ_s)	**29**	**N/m2**	
D50 (Median Particle Size)	150	mm	
Convert to kg to N	1471.5	N	
Shear Stress Resistance Bottom (τ_{cb})	**94**	**N/m2**	
Resitance Bottom > Shear Bottom?	**OK**		
Side Slope/Bank Angle (θ)	34	degrees	
Angle of Repose (ϕ)	42	degrees	MTO Design Chart 2.13
Kcs (channel sides)	0.56		θ must be < ϕ for calculation to work
Shear Stress Resistance Channel Sides (τ_{cs})	**53**	**N/m2**	
Resitance Sides > Shear Sides?	**OK**		



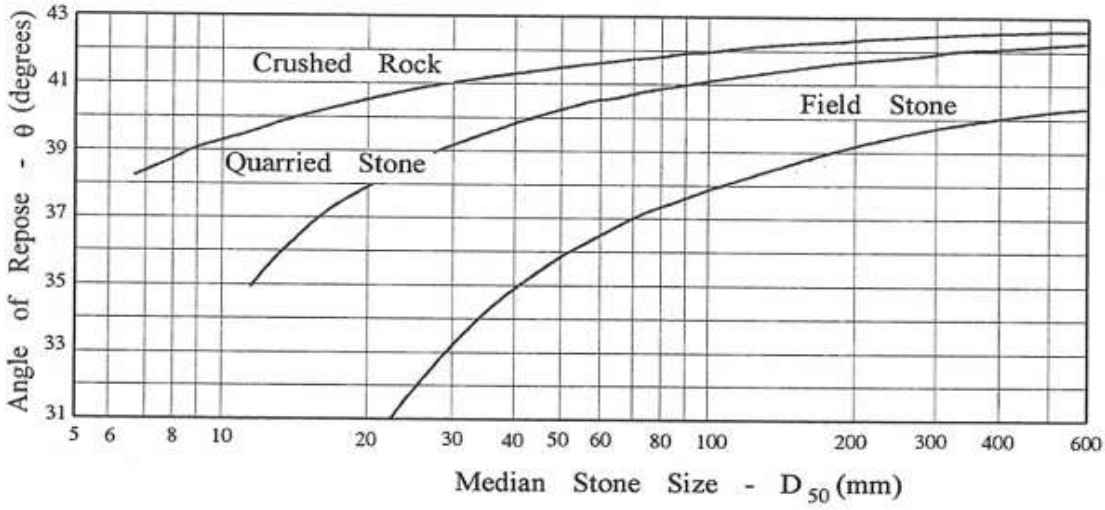
Design Chart 2.11: Coefficients of Boundary Shear on Channel Bed



Design Chart 2.12: Coefficients of Boundary Shear on the Side Slope



Design Chart 2.13: Determining Angle of Repose



Natalie Biesinger

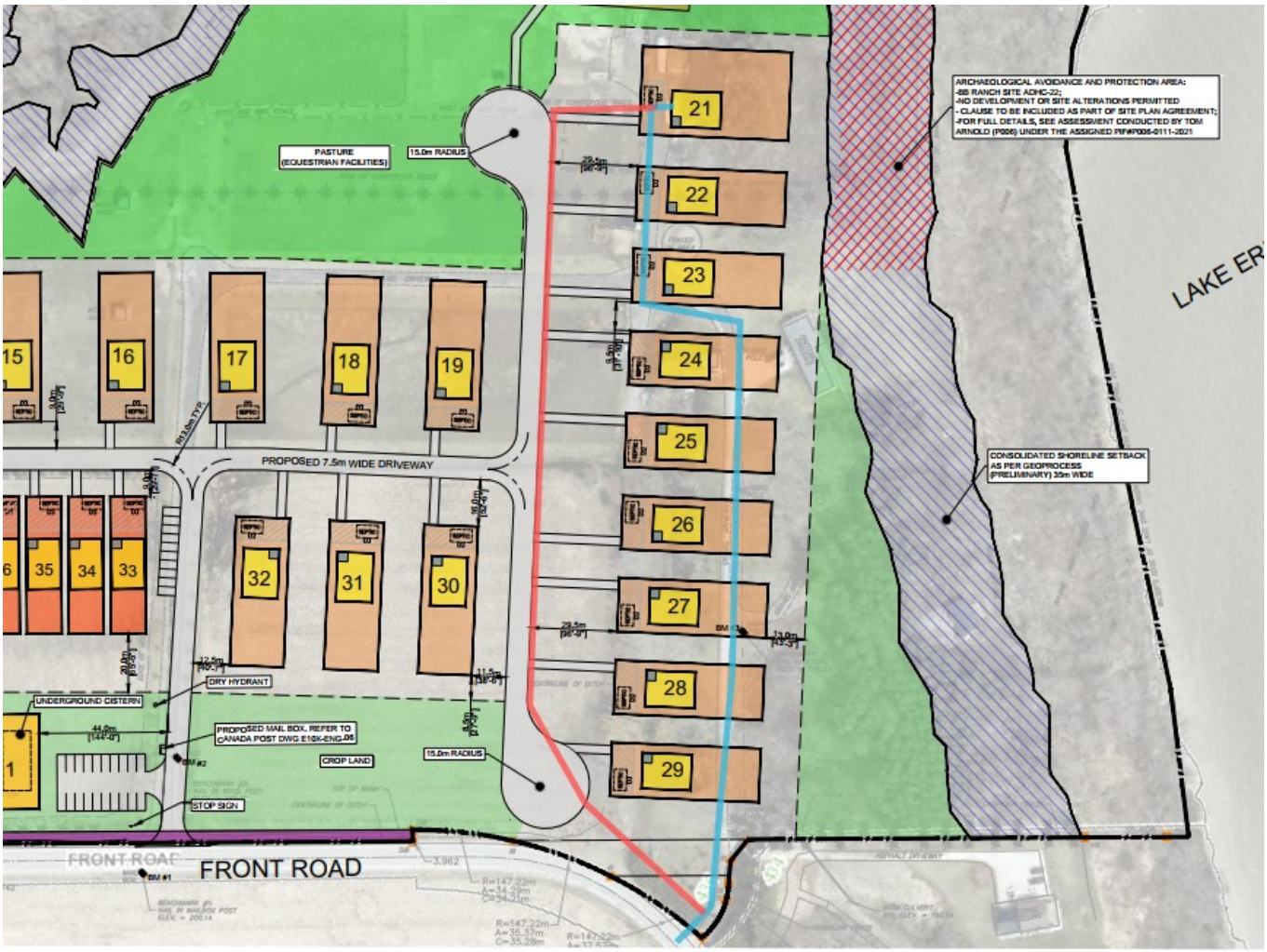
From: John Iezzi
Sent: Tuesday, November 28, 2023 9:40 AM
To: Natalie Biesinger
Subject: FW: Water service at BB Ranch
Attachments: SitePlan - Water location.pdf

Importance: High

From: John Iezzi
Sent: Monday, November 27, 2023 3:11 PM
To: Stephen Gradish <Stephen.Gradish@norfolkcounty.ca>
Cc: Eldon Darbyson <eldondarbyson@gdvallee.ca>
Subject: FW: Water service at BB Ranch
Importance: High

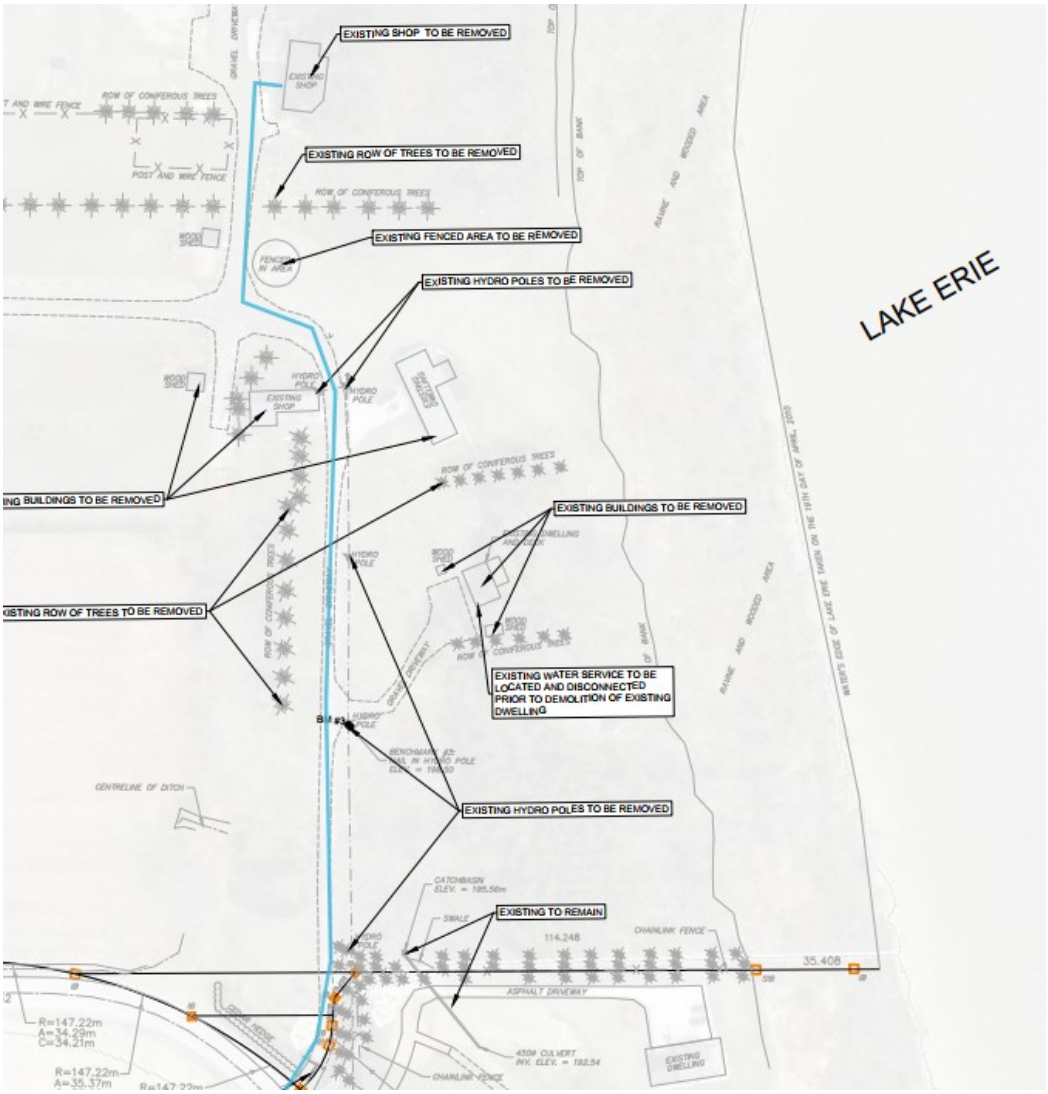
Hi Stephen,
As a follow up to our discussion earlier, please see below and attached.
The blue line shows the approximate location of the existing water service on the property, the red line shows the intended relocation. The existing line roughly follows the existing road and supplies water to the shop located on the future condo lot 21.

All other condo units will remain on cisterns, as proposed. As noted be Jeff below - this line will provide water to unit 21 only.



NING PROVISIONS 14.1002:

CHED RESIDENTIAL DWELLINGS	UNITS 2-19



As discussed, please circulate internally for comments and what else may be required. We appreciate your prompt attention to this as time is of the essence.

Thank you!

John Iezzi, P.Eng.
G. DOUGLAS VALLEE LIMITED
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vallee
Consulting Engineers, Architects & Planners

From: Jeff Bouck <jeff@bouckinc.com>
Sent: Monday, November 27, 2023 2:23 PM
To: John Iezzi <johniezzi@gdvallee.ca>
Cc: Eldon Darbyson <eldondarbyson@gdvallee.ca>; John Vallee <Johnvallee@gdvallee.ca>; Rebecca Bouck

<rebecca@bouckinc.com>; Scott Puillandre <Scottpuillandre@gdvallee.ca>
Subject: Re: FW: Water service at BB Ranch

Hello John

The water line is basically as you show.

We have no intent on filling peoples cisterns.

We will simply run a new line along the road / drive from the hook up & reconnect to the end of our existing service. (same time as hydro install).
No interference on any of the new condos.

Jeff Bouck
519-865-3030
jeff@bouckinc.com

From: Jeff Bouck <jeff@bouckinc.com>
Sent: Wednesday, October 18, 2023 10:50 AM
To: John Iezzi <johniezzi@gdvallee.ca>; John Vallee <Johnvallee@gdvallee.ca>; Scott Puillandre <Scottpuillandre@gdvallee.ca>
Cc: Jeff Bouck <jeff@bouckinc.com>; Rebecca Bouck <rebecca@bouckinc.com>
Subject: Water service at BB Ranch

John I

I'm confirming we do have water supplied to 436 Front Rd currently from Norfolk County.

We're expecting that to remain to condo 21, where our home will be. It is currently run there now.

As previously stated, all others will be on a cistern.

Jeff Bouck
519-865-3030
jeff@bouckinc.com

For God so loved the world that he gave his one and only Son, that whoever believes in him shall not perish but have eternal life. John 3:16

10-094 BB Ranch

Comments by: Norfolk County
Development Application: SPPL2022212
Property Address: 436 Front Rd, St Williams, ON N0E 1P0
Property Assessment Roll Number: 43310543040077000000

Comment On	Department	REF #	Date	Comment	Response	Task/Owner	Status
2nd SUBMISSION							
2nd Submission	Development Engineering **(General)**	1	25-Sep-23	Securities will be required in the form of a Schedule 'H' template. 10% for sitework completed on private property and 100% of works completed within the municipal R.O.W. Dev Eng reviewed the submitted securities and found they were in general conformance with our standards. If there are any revisions required as part of the next submission, please revise accordingly. The following items were recognized as missing. a. Please include a line item with the appropriate cost of disconnecting the existing water service. (100%) b. Please include a line item to remove the existing entrance and restoration of the municipal ROW. (100%) c. Please provide a line item for completion of As-built drawings. (100%)	a. The exisitng service is going to be abandoned, and a new water service shall be installed. The drawings have been updated to reflect this change and line items with the appropriate cost of disconnecting the exsiting water service and installing the new service have been provided. Waiting for comment from county. b. An item to remove the existing entrance and restoration of the municipal ROW is included as part of items 2, 3, 6. c. A line item for completion of As-Built drawings has been provided.	Vallee	Pending
2nd Submission	Development Engineering **(General)**	2	25-Sep-23	Please include an Electrical Services plan with your next submission. As per Section 16.4.05 of Norfolk County Design Criteria an Electrical Services Plan is required.	An Electrical Services Plan has been provided as part of this submission.	Vallee	Complete
2nd Submission	Development Engineering **(General)**	3	25-Sep-23	As mentioned in the previous submission, prior to Site Plan Approval Development Engineering will request confirmation that the Road Widening dedication to the County has been started with the County Clerk and our Realty Services Department. Please provide updates on this if available.	Plans by Jewitt and Dixon have been provided as part of this submission.	Vallee	Complete
2nd Submission	Development Engineering **(Traffic Impact Study)**	4	25-Sep-23	In the latest submission Development Engineering could not locate where it has been confirmed there are adequate sight lines from the proposed driveway for the proposed vehicles that will use the entrance. As mentioned in the previous Development Engineering comments. "In your next submission please indicate whether the proposed entrances have adequate site distances for all traffic movements including Truck and Horse trailer combos and Garbage trucks.	Paradigm has reviewed and has confirmed the proposed site entrances provide adequate site distances.	Vallee	Complete
2nd Submission	Development Engineering **(Functional Servicing/Stormwater Managment Reprot)**	5	25-Sep-23	In this submission Development Engineering recognizes that an entirely separate Stormwater Management report was included. At this time Development Engineering does not have any additional comments however prior to site plan approval we will need to confirm LPRCA is satisfied with the proposed outlets. If any changes are required to satisfy LPRCA or other agencies, then Development Engineering will need to complete another review.	Noted. An updated Stormwater Management Report has been included as part of this submission for review and approval by Norfolk County and the LPRCA.	Vallee	Complete
2nd Submission	Development Engineering **(Functional Servicing/Stormwater Managment Reprot)**	6	25-Sep-23	In the new Stormwater management report, it describes Outlet B as being an existing 450mm culvert that travels onto the neighboring property. If this is the preferred outlet, Development Engineering will require that easements be created, or a Mutual Drain agreement be registered on title to formalize the agreement between landowners to accept overland storm water. If easements or a Mutual Drian agreement already exists, please provide those details.	A Mutual Drain Agreement has been provided as part of this submission.	Vallee	Complete
2nd Submission	Development Engineering **(Functional Servicing/Stormwater Managment Reprot)**	7	25-Sep-23	Prior to Development Engineering approval of the overall SWM concept, Norfolk County will require sign off and approval from LPRCA.	Conditional approval from the LPRCA has been provided as part of this submission.	Vallee	Complete
2nd Submission	Development Engineering **(C100 Site Plan)**	8	25-Sep-23	Development Engineering has recognized that the most northerly bulb is not round on the drawings? Please explain how this bulb meets OPSD 500.01. Please confirm that the 15m radius is actual asphalt and that no overhang of parked vehicles will impede traffic flow. All bumpers of larger vehicles must have a clear path of travel if the tires follow the outside radius.	The most northerly bulb has been revised to meet OPSD 500.010. The 15m radius is actual asphalt and no overhang of parked vehicles will impede traffic flow.	Vallee	Complete

2nd Submission	Development Engineering **(C101 Grading & Servicing Plan)**	9	25-Sep-23	In your next submission please provide a note in the general location where existing Water service crosses Property line stating the following: “Existing Water service to be disconnected prior to the demolition of the existing home. Location of the disconnection to be determined by the General Manager of Environmental and Infrastructure services or designate.” As Development Engineering now understands that the proposal is to permanently abandon the existing Water service, it is the recommendation of Norfolk County that the disconnection is to take place at the watermain. The final determination of where the disconnection will take place will be decided at the time of demolition permit.	The exisitng service is going to be abandoned, and a new water service shall be installed. The drawings have been updated to reflect this change. Waiting for comment from county.	Vallee	Pending
2nd Submission	Development Engineering **(C101 Grading & Servicing Plan)**	10	25-Sep-23	In the previous comments Development Engineering asked “Please revise the typical Road Section to have the correct road width. The Minimum Road width internally is 7.3m” It was not recognized that the changes were made. Please include it in your next submission.	The internal road width has been updated to 7.5m and the typical road section has been updated accordingly.	Vallee	Complete
2nd Submission	Development Engineering **(C101 Grading & Servicing Plan)**	11	25-Sep-23	In review of the new profile for the emergency access the “Match” grades appear to be lower than the entrance grades which do not correspond with the profile shown. Please review and revise as necessary.	The proposed profile has been revised to match the grades shown on the plan.	Vallee	Complete
2nd Submission	Development Engineering **(C101 Grading & Servicing Plan)**	12	25-Sep-23	As mentioned above the most northerly bulb is not shown as round. Please review this bulb design and revise to meet OPSD 500.01.	The most northerly bulb has been revised to meet OPSD 500.010.	Vallee	Complete
2nd Submission	Development Engineering **(C101 Grading & Servicing Plan)**	13	25-Sep-23	As mentioned above Development Engineering will require confirmation through Mutual Drainage Agreement or easements that Outlet B is a legal outlet to discharge stormwater from this redeveloped site through a neighboring property. It is the understanding of Development Engineering that this existing culvert will convey the 100 yr storm based on internal ditch design which is stated to be designed to hold the major storm. Please confirm.	A Mutual Drain Agreement has been provided as part of this submission. The existing culvert will convey the 10-year design storm and during larger storm events, stormwater runoff will flow overland to the gravel access road, and ultimately to Lake Erie as it does in pre-development conditions.	Vallee	Complete
2nd Submission	Long Point Region Conservation Authority	1	19-Sep-23	A pre and post development flow comparison is expected in the final report. The flows should be dictated based on a quantitative analysis.	As per direction the pre-con meeting minutes from the LPRCA, "SWM outlet directly to Lake Erie does not require quantity control". The proposed stormwater management strategy is discharge storm runoff directly to Lake Erie, therefore a pre to post development flow comparison is not required.	Vallee	Complete
2nd Submission	Long Point Region Conservation Authority	2	19-Sep-23	LPRCA is concerned that outlet A is not a legal outlet. From the drawings provided it does not appear to be within the property limits. If this is not a legal outlet, a different concept will need to be considered.	A Mutual Drain Agreement has been provided as part of this submission.	Vallee	Complete
2nd Submission	Long Point Region Conservation Authority	3	19-Sep-23	The Geotechnical engineer who analyzed the slope and wrote the geotechnical report for this site should review the storm water management concept and provide design recommendations for the proposed outlets.	The Geotechnical engineer who analyzed the slope and wrote the geotechnical report has reviewed and approved the storm water management concept and erosion protection strategy.	Vallee	Complete
2nd Submission	Long Point Region Conservation Authority	4	19-Sep-23	Even though the post development flows will be reduced below predevelopment flow rates, the changes in grades will result in an increase in concentration of these flows down these specified outlets. Special attention to erosion prevention should be made with the help of the Geotechnical engineer.	The Geotechnical engineer who analyzed the slope and wrote the geotechnical report has reviewed and approved the storm water management concept and erosion protection strategy.	Vallee	Complete