

# Flood Risk Mitigation Strategy

Barneys Brook



EAST HANTS

# Project Summary

## Key Highlights

The CN Rail culvert near the outlet of Barneys Brook is a major contributor to flooding. Upgrading the culvert could reduce peak flood levels by up to 3.1 m under severe storm conditions and should be prioritized.

Each scenario increasingly impacts properties between Isenor Rd and Robert Scott Drive.

## Project Scope

Complete a hydrologic and hydraulic assessment of a defined study area along Barneys Brook, located in Lantz, NS utilizing recent LiDAR data and modelling software. The study area will extend from Barneys Brook intercepts with Nova Scotia Trunk 14 to the intercept with the Shubenacadie River.

## Project Goals

To map flood extents within the study area to identify flood risk zones, and identify any undersized or damaged culverts along the extents.

### MILESTONES



**Project Start**  
October-2025



**Kick-off Meeting**



**Topographic Surveying**



**Draft Report Deliverable**



**Interim Map Deliverable**



**Project End – Final Deliverables**

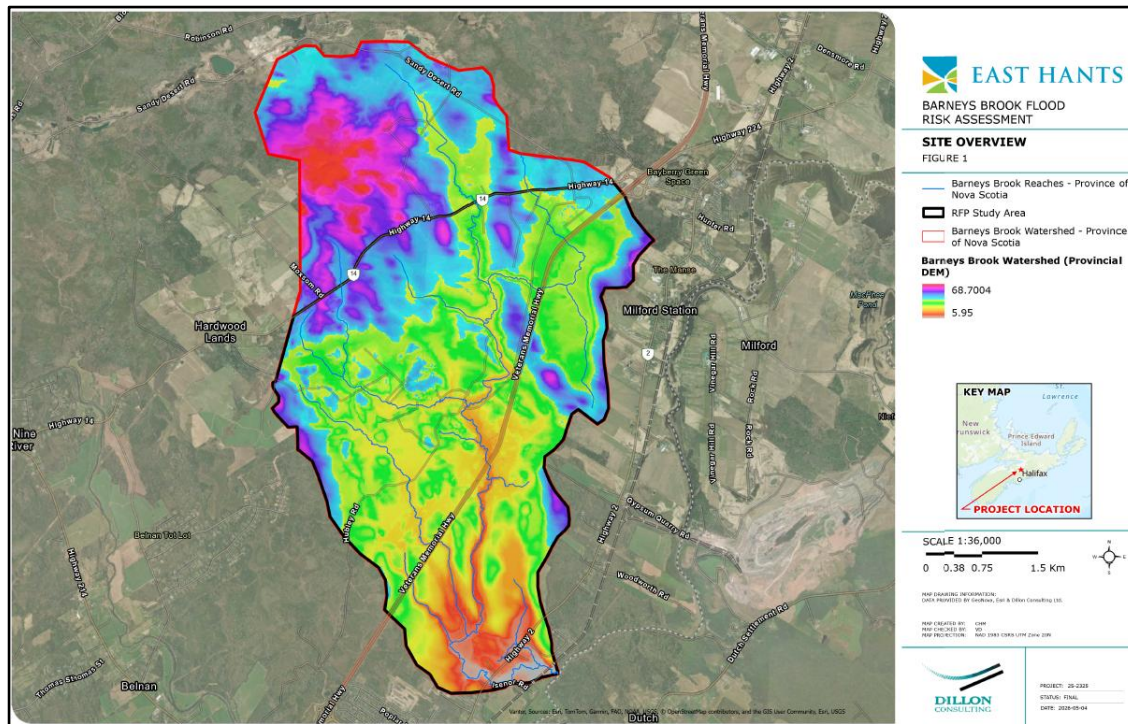


**Meeting of Council**  
June-2026



# Study Area

The defined study area, as presented, extends from the intersection of Barneys Brook and Nova Scotia Trunk 14 to the confluence of Barneys Brook with the Shubenacadie River. The reach length is approximately 8.5 km in length.

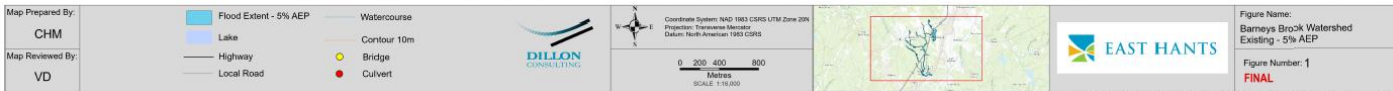


# Flood Maps - Existing Conditions

Flood extents are presented for the following storm events and climate scenarios to provide context for the recommended mitigation measures discussed in subsequent slides:

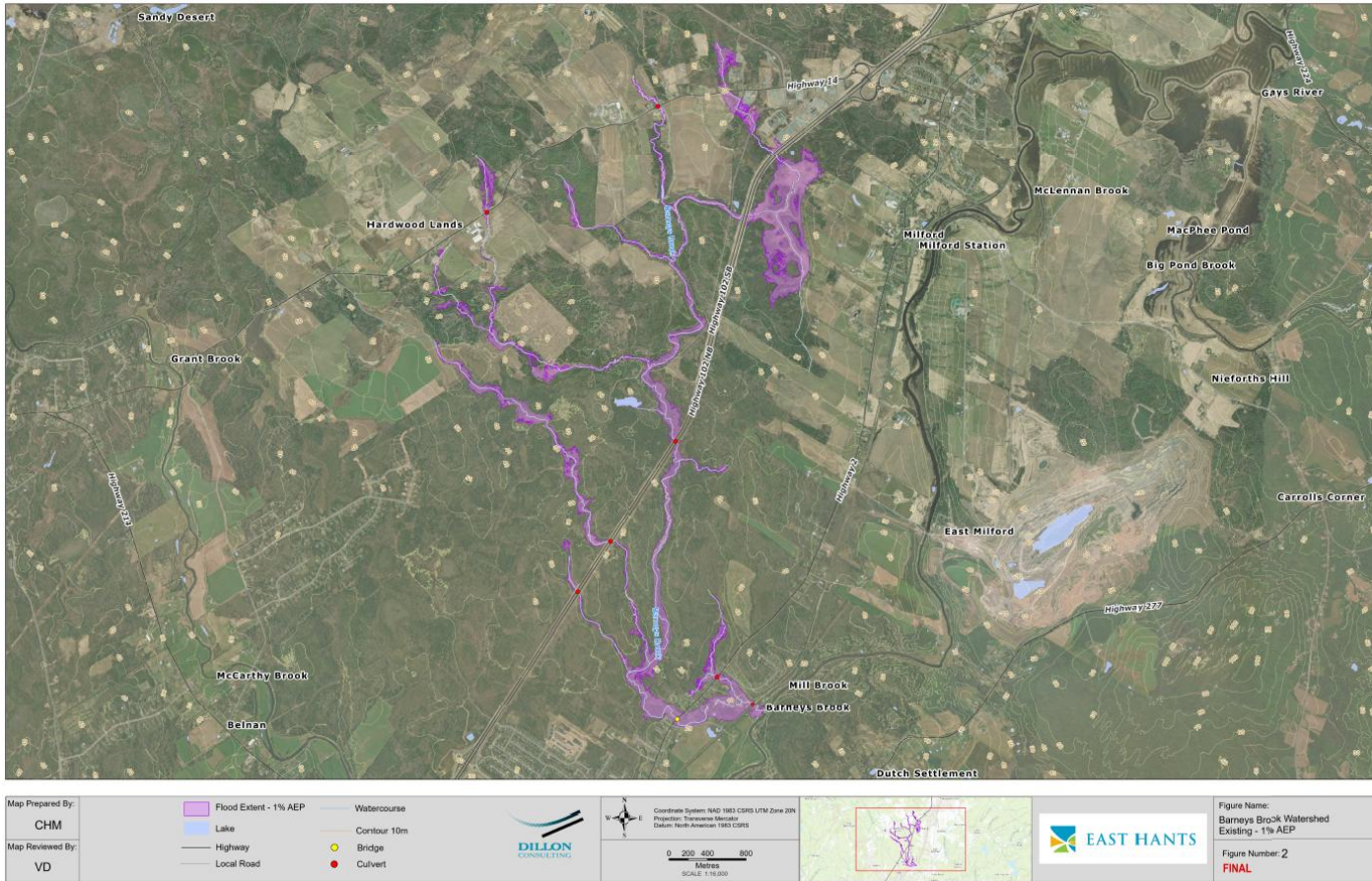
## Existing Conditions

- 5% AEP (1 in 20yr)
- 1% AEP (1 in 100yr)
- 5% AEP (1 in 20yr) 2100 Climate Change
- 1% AEP (1 in 100yr) 2100 Climate Change



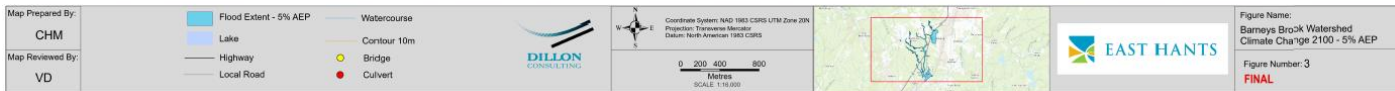
# Existing Conditions

5% AEP (1 in 20yr)



## Existing Conditions

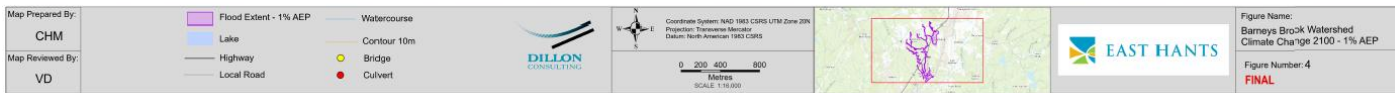
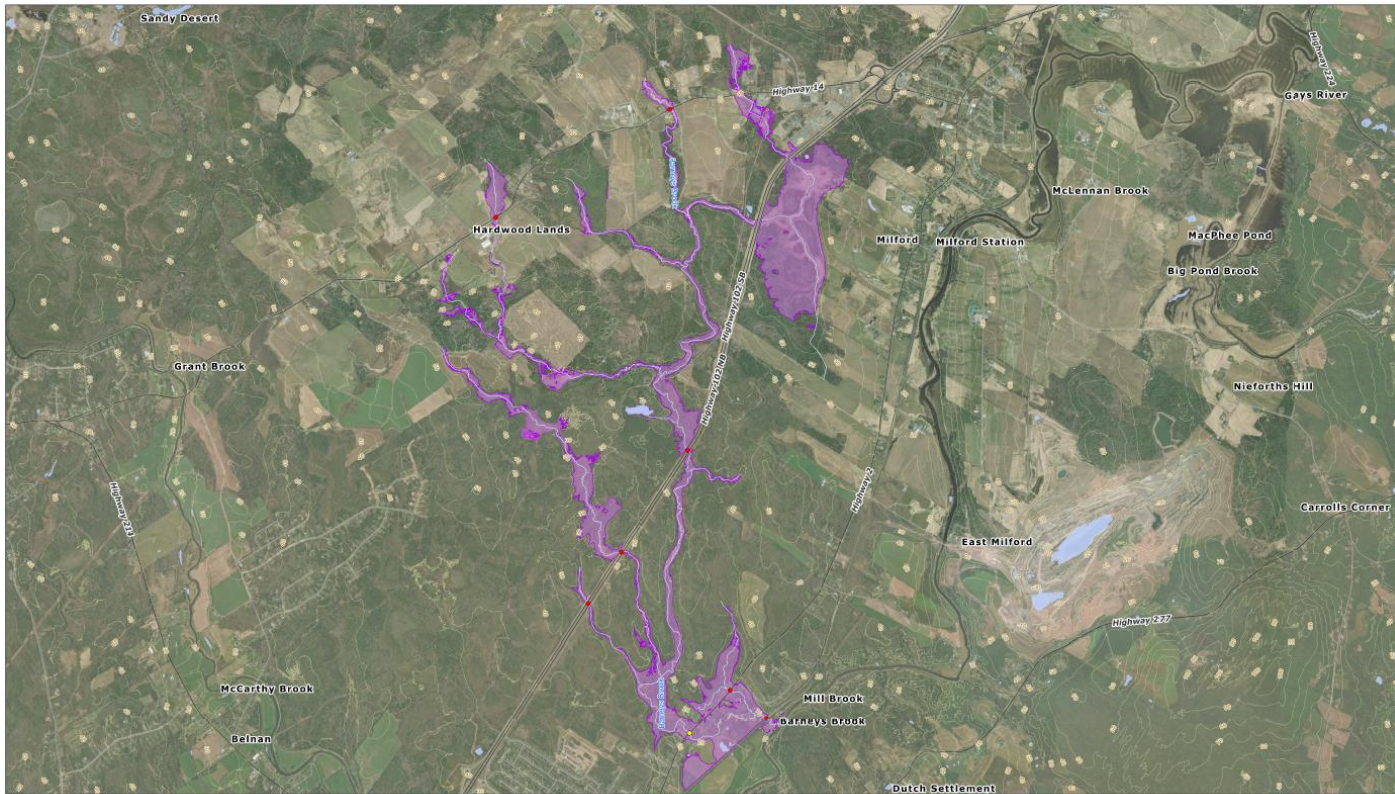
1% AEP (1 in 100yr)



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## Existing Conditions

5% AEP (1 in 20yr) + 2100 Climate Change



## Existing Conditions

1% AEP (1 in 100yr) + 2100 Climate Change

## Areas of Concern

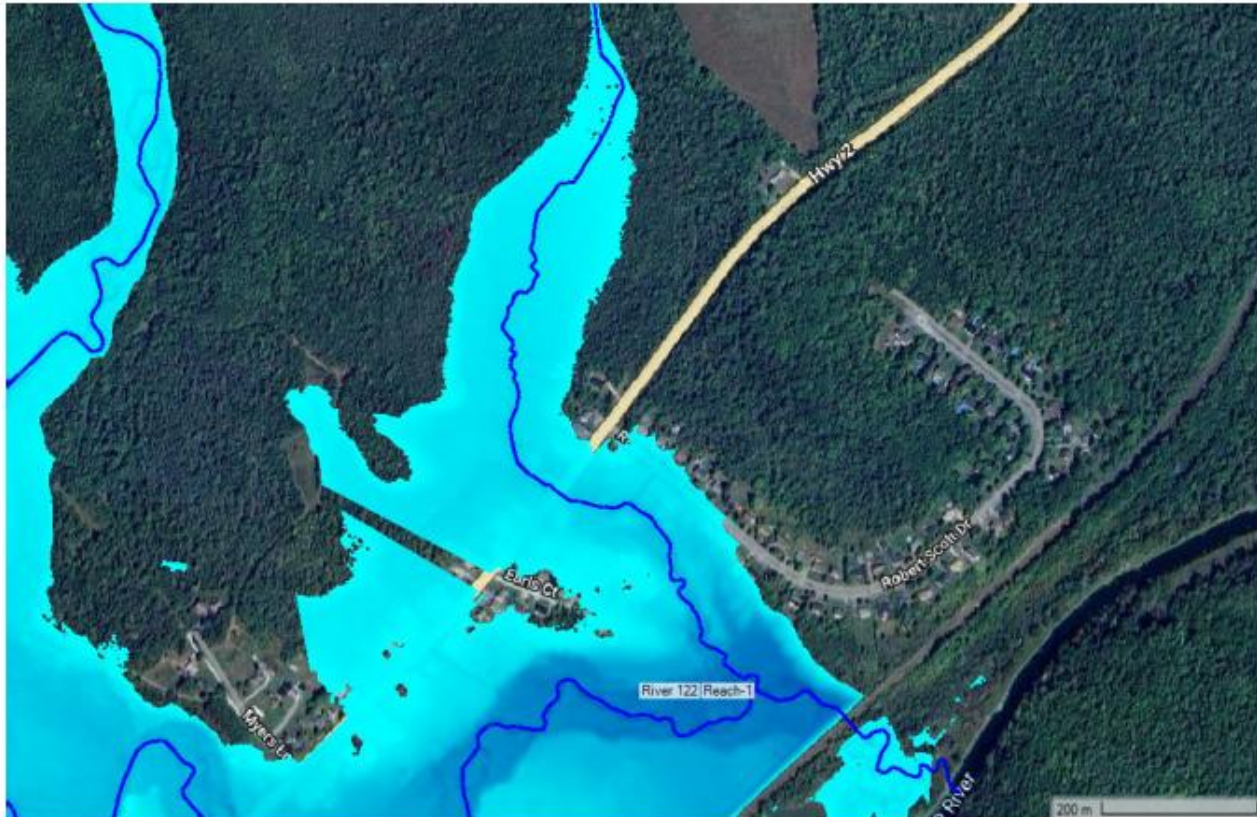
#	Location	Existing 1% AEP Elevation (m CGVD2013)	Climate Change 1% AEP Elevation (m CGVD2013)	Difference (m CGVD2013)
1	The outlet of Barneys Brook at the CN Railway	16.0	17.5	1.5
2	Highway 2 near Robert Scott Drive	15.6	17.5	1.7
3	Highway 2 between Barneys Lane and Myers Lane	15.5	17.5	2.0
4	Highway 102: The east side of Highway 102 towards the northern end of the watershed	23.0	25.0	2.0

# 1. The Outlet of Barneys Brook at the CN Railway



Figure 8: CN Railway at the outlet of the river – 1% AEP Climate Change

## 2. Hwy 2 near Robert Scott Drive



**Figure 10: Highway 2 near Robert Scott Drive - 1% AEP 2100 Climate Change**

*\*Please note while there is a gap in the model, this gap was compensated for in the mapping phase*

### 3. Hwy 2 between Barneys Lane and Myers Lane

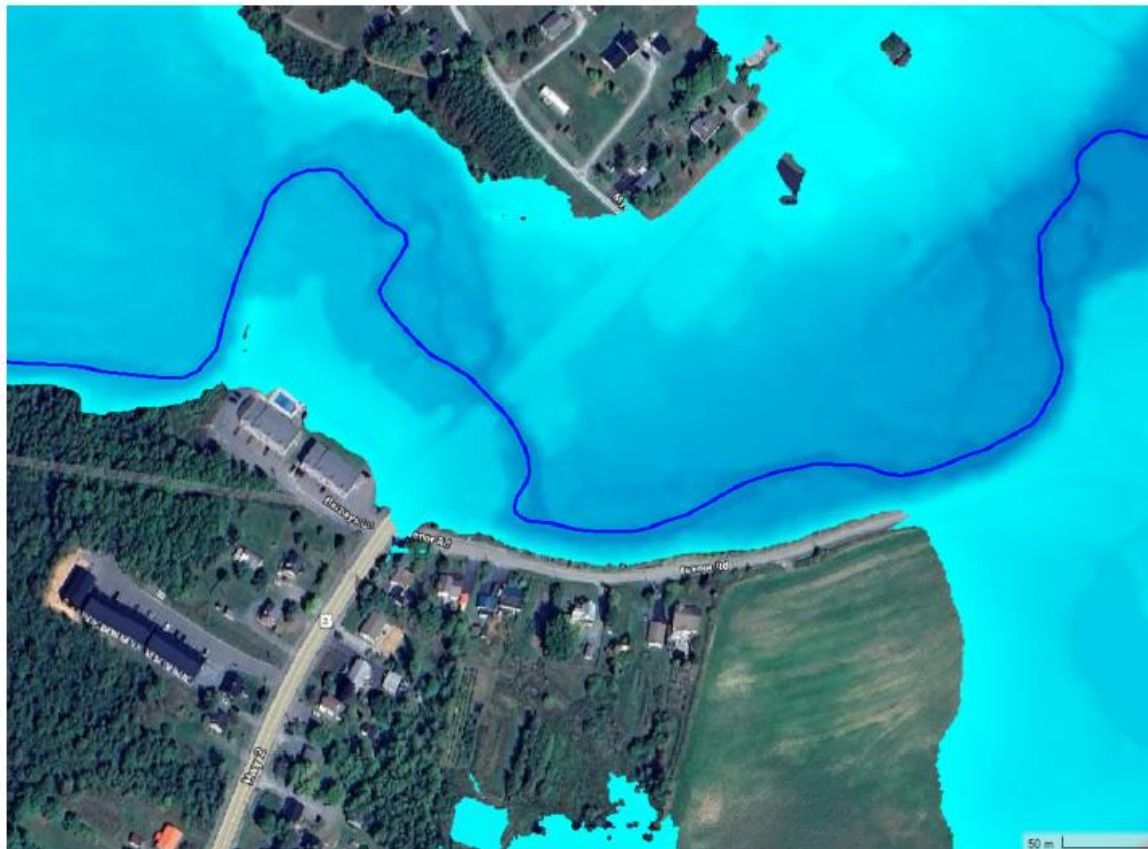


Figure 12: Highway 2 between Barneys Lane and Myers Lane- 1% AEP 2100 Climate Change

## 4. Hwy 102: The East side of Highway 102 towards the Northern end of the watershed



Figure 14: Highway 102 Flood Extent - 1% AEP 2100 Climate Change

## Mitigation Options

The flood mitigation recommendations have been prioritized based on anticipated watershed-wide impact, with Recommendation #1 (CN Railway culvert upgrade at the system outlet) identified as the highest priority and most significant contributor to reducing flood risk throughout the watershed.

- Recommendation #1:** Structure upgrades (culvert - DCS007)  
CN Railway culvert upgrade at the system outlet
  
- Recommendation #2:** Structure upgrades (culvert - DCS001)  
Highway 2 near Robert Scott Drive
  
- Recommendation #3:** Structure upgrades (culvert - DCS005)  
Highway 14 near Moxsom Road
  
- Recommendation #4:** Debris Cleanup and Channel Maintenance  
Between Hwy 2 and Hwy 102

## Recommendation #1: DCS007 at the outlet of the system under the CN Railway



Figure 15: Outlet of the system with triple barrel upgrade (existing condition left, proposed recommendations right)– 1% AEP (2100)

# Recommendation #1: DCS007 at the outlet of the system under the CN Railway

Table 18: Elevation Differences After Proposed Upgrades – DCS007

Structure ID	Location	Existing Size and Material	Proposed Recommendation	Existing Conditions Water Elevations – Climate Change (1% AEP)*	Proposed Upgrade Water Elevations – Climate Change (1% AEP)*	Elevation Difference*
DBS001	Highway 14 near Moxsom Rd	1 x 2,400 Corrugated Metal Semi-Circular Culvert at DCS007	3 x 2,800mm Concrete Circular Culverts at DCS007	17.5	14.4	3.1
DCS001	Highway 2 near Robert Scott Dr			17.5	15.2	2.3
DCS007	Outlet of Barneys Brook			17.5	14.5	3.0

\*m CGVD2013

## Recommendation #2: DCS001 Highway 2 near Robert Scott Drive



Figure 16: Highway 2 near Robert Scott Drive with twin 2,400mm upgrade (existing condition left, proposed recommendations right)– 1% AEP (Existing)

## Recommendation #2: DCS001 Highway 2 near Robert Scott Drive

Table 19: Elevation Differences After Proposed Upgrades – DCS001

Structure ID	Location	Existing Size and Material	Proposed Recommendation	Existing Conditions Water Elevations – Existing (1% AEP)*	Proposed Upgrade Water Elevations – Existing (1% AEP)*	Elevation Difference*
DCS001	Highway 2 near Robert Scott Drive	A 900mm Steel Circular Culvert and a 1,500mm Concrete Circular Culvert.	Twin 2,400mm Circular Concrete Culvert	15.86	15.63	0.23

\*m CGVD2013

## Recommendation #3: DCS005 Highway 14 near Moxsom Road

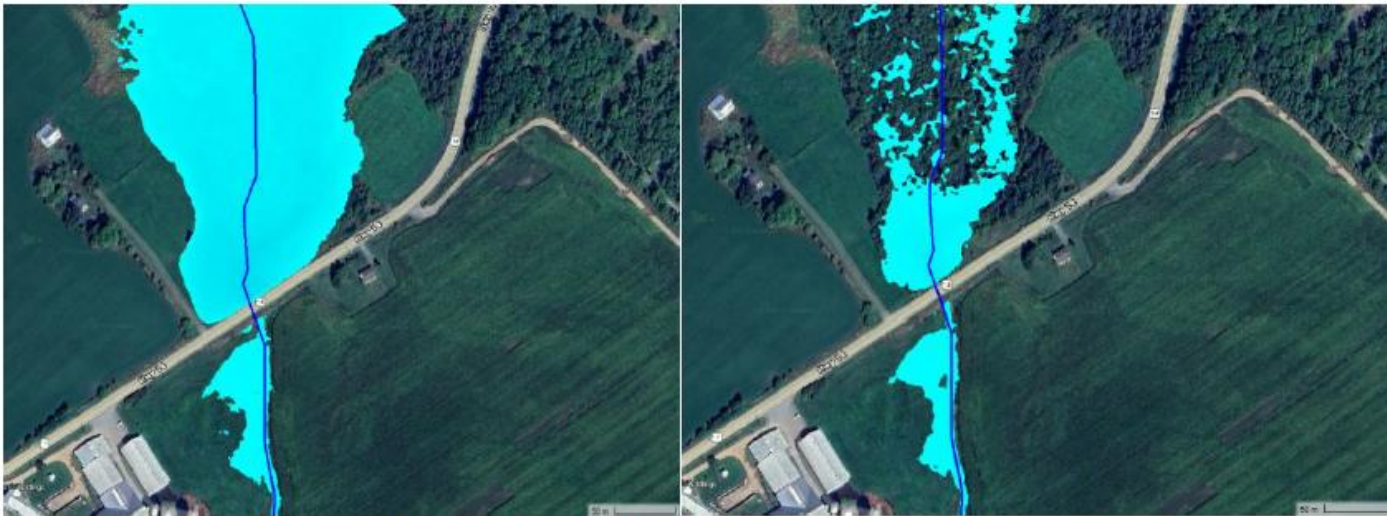


Figure 17: Highway 1 near Moxsom Road with 1,200mm upgrade (existing condition left, proposed recommendations right)– 1% AEP (2100)

## Recommendation #3: DCS005 Highway 14 near Moxsom Road

Table 20: Elevation Differences After Proposed Upgrades – DCS005

Structure ID	Location	Existing Size and Material	Proposed Recommendation	Existing Conditions Water Elevations – Climate Change (1% AEP)*	Proposed Upgrade Water Elevations – Climate Change (1% AEP)*	Elevation Difference*
DCS005	Highway 14 near Moxsom Rd	900 mm Circular Concrete Culvert	1,200 mm Circular Concrete Culvert	47.98	46.70	1.3

\*m CGVD2013

## Recommendation #4: Debris Cleanup and Channel Maintenance - Between Hwy 2 and Hwy 102

The hydrologic and hydraulic simulations are conducted under the assumption that hydraulic structures and the main channel of Barneys Brook remain free of significant debris or blockages. However, field observations conducted during the data collection phase identified several areas where debris accumulations and beaver dams are present within the study reach.

The presence of these obstructions has potential implications for the accuracy of flood line mapping and the performance of infrastructure:

- **Elevated Water Surface Elevations:** Debris at culvert inlets or dams within the channel increases the hydraulic roughness and restricts the available flow area. This leads to localized increases in water surface elevations, which can result in flow differences.
- **Reduced Level of Service:** Structures that are conceptually sized to convey a 1% AEP flood event could experience premature overtopping if the effective opening is reduced by debris or biological dams.
- **Backwater Effects:** Localized blockages function as unintended hydraulic pinch points, generating backwater effects that influence upstream drainage.
- **Structural Risks:** The accumulation of debris during high-intensity meteorological events increases the pressure on embankments and culvert headwalls, potentially leading to asset failure.

# What is Dillon Recommending?

## Engagement with Infrastructure Owners

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To facilitate the proposed infrastructure upgrades, a collaborative framework with infrastructure owners is required. Coordination with third-party owners should be established as a necessary component for the mitigation of regional flood risks. The following steps are proposed for the engagement process:

- **Information Sharing:**
  - Hydraulic modelling results and simulated energy grade line profiles can be provided to CN Rail to illustrate the impact of the existing culvert bottleneck on upstream water surface elevations. Based on preliminary results presented in this study, Dillon recommends an upgrade from the existing infrastructure at the railway crossing to triple barrel concrete 2,800 mm culverts to reduce upstream water surface elevations.
  - Hydraulic modelling results and simulated energy grade line profiles can be provided to the NSDPW to illustrate the impact of the existing hydraulic structures along provincial highways. These include DCS001 and DCS005.
- **Integrated Mitigation Planning:** The upgrades to the culvert under the railway crossing may be pursued in conjunction with upstream municipal or provincial infrastructure improvements. Based on previous studies conducted by Dillon, standalone upgrades to upstream bridges or culverts often result in negligible impacts if the primary downstream restriction remains unaddressed.
- **Cost-Sharing Framework:** Establish a formal negotiation with CN Rail regarding a cost-sharing agreement for the proposed upgrades. As the existing infrastructure is identified as a primary contributor to regional flood risk, a partnership model could be pursued that reflects the shared benefit of protecting both the rail corridor and upstream municipal assets.
- **Stakeholder Consultation:** Formal meetings are coordinated to review the technical feasibility and constructability of the proposed upgrades. Discussions are intended to align project objectives with the long-term maintenance and rehabilitation schedules of the railway.
- **Regulatory and Technical Refinement:** Refinement of the conceptual design should be undertaken during detailed engineering phases to address structural requirements, site conditions, and environmental permitting associated with work in the railway or roadway right-of-way.



## Staff Recommendation

- ***Move that the Infrastructure & Operations Committee Recommend to Council that the Barneys Brook Flood Mitigation Study presented at the June 2026 meeting of East Hants Executive Committee be shared with; CN Rail, MP Blois, MLA MacDonald, that a letter be sent to MP Blois requesting Federal support in championing a Culvert Expansion project in collaboration with CN as per the sizing recommendations in the report, and that Municipal staff setup a report overview with Nova Scotia Department of Public Works technical staff.***

# Climate Change Impacts

**Table 7: CC-Scaling Method vs. IDF CC Tool Climate Change Projections: 24-hour Precipitation**

AEP (%)	Historical 24-hour Rainfall Depth (mm)	C-C Scaling Method Projected Future 2100 24-hour Rainfall Depth (mm)	IDFCC Tool Projected Future 2100 SSP 8.5 24-hour Rainfall Depth (mm)
<b>Halifax Intl A Climate Station (8202251)</b>			
5	115.04	171.72	137.55
1	140.78	210.15	164.62

**Table 8: CC-Scaling Method vs. IDF CC Tool Climate Change Projections: 48-hour Precipitation**

AEP (%)	Historical 48-hour Rainfall Depth (mm)	C-C Scaling Method Projected Future 2100 48-hour Rainfall Depth (mm)	IDFCC Tool Projected Future 2100 SSP 8.5 48-hour Rainfall Depth (mm)
<b>Halifax Intl A Climate Station (8202251)</b>			
5	165.18	246.58	197.43
1	201.79	301.22	237.01

Based on this analysis, the two methods are in close agreement with the CC Scaling Method values as more conservative. This aligns well with the Municipalities Standards, which are in accordance with the CSA W231 standards, that recognizes the CC Scaling Method.

# Reference Return Period Rainfall Amounts

**Table 6: IDF Rainfall Depths for the Halifax International Airport ECCC Climate Station**

<b>AEP (%)</b>	<b>Halifax Intl A (8202251) 24-hour Rainfall Depth (mm)</b>	<b>Halifax Intl A (8202251) 48-hour Rainfall Depth (mm)</b>
50	71.66	105.13
20	88.78	131.48
10	102.53	148.66
5	117.88	165.18
2	141.46	186.70
1	162.35	201.79

