Environment and Climate Change Canada | Environnement et Changement climatique Canada

EFFECTS MONITORING OF SHALLOW DISPOSAL SITES ON CANADA'S EAST COAST: CHANGING TRENDS AND NEW HYPOTHESES

LC/SG 48 – Science Day

13 March 2025

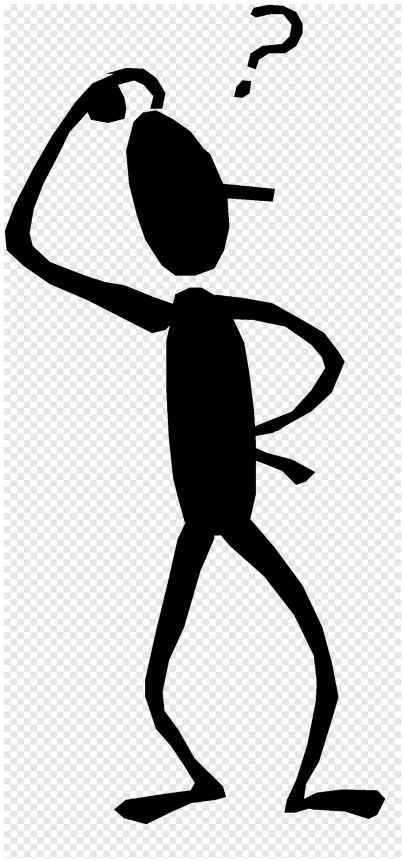
DISPOSAL SITE MONITORING IN CANADA …

Canada began issuing Disposal at Sea permits

Environmental monitoring program began

Monitoring program was made possible by the implementation of user fees

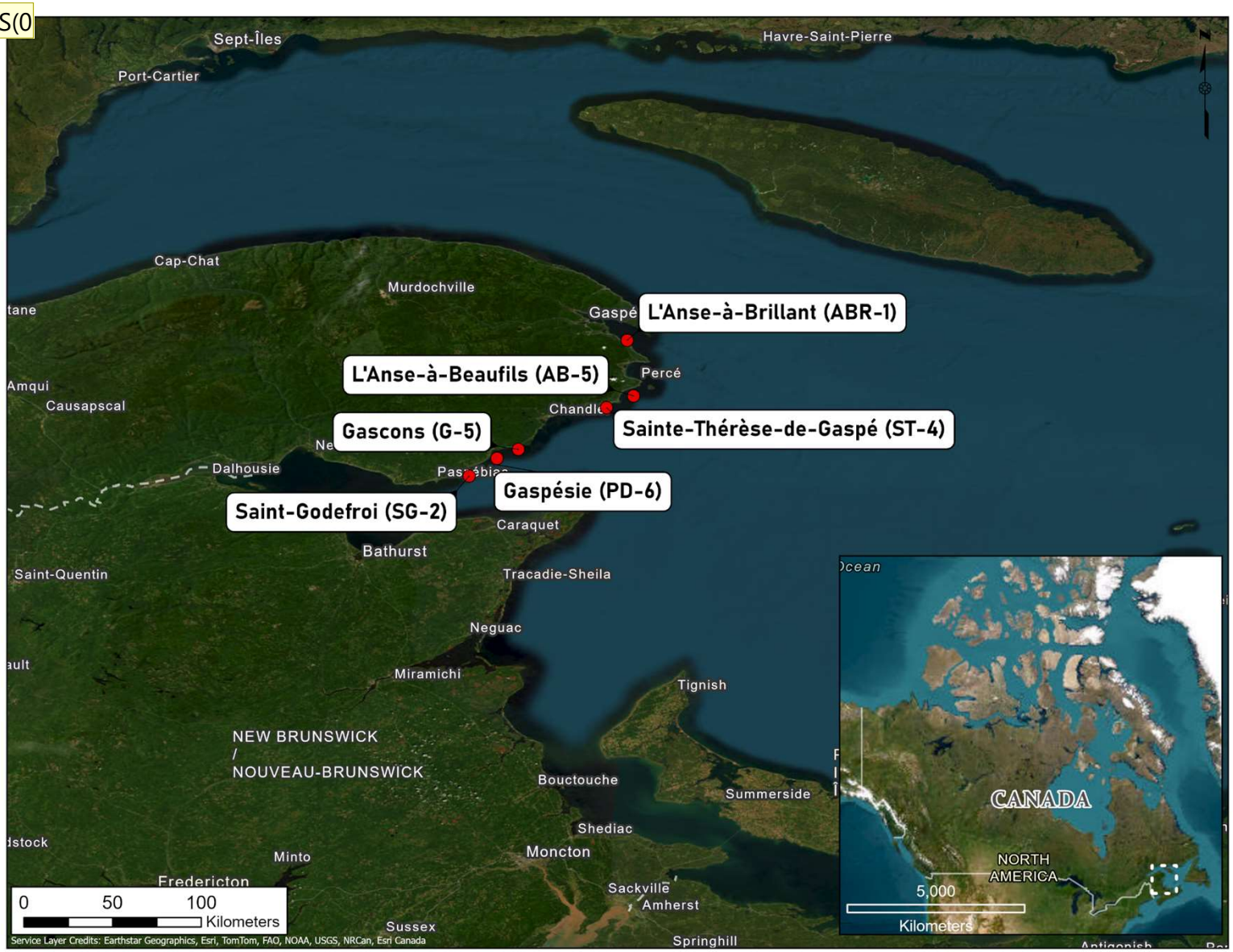
Environmental monitoring occurs annually, with sites prioritized based on activity level or specific issue



MONITORING IN THE GASPÉSIE, QUÉBEC

Unexpected monitoring results are leading to changing hypotheses and increased monitoring

DISPOSAL SITES IN CANADA



Gaspésie, Québec disposal sites

Early 1980s:
17 disposal sites

Present:
6 disposal sites (red dots)

Slide 5

S(0 Would you like a new map done? If so, do you just want the QUE sites on it?

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ACTIVE SITES IN GASPÉSIE

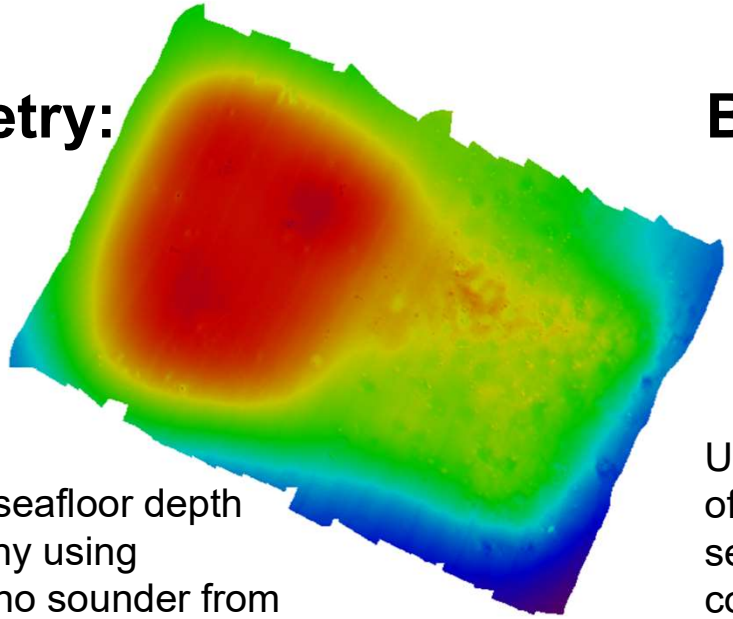
Disposal site name	Location	Opening year	Distance from shore (km)	Depth (m)	Slope (degrees)	Cumulative disposed volume (m^3)	Mean disposed volume (m^3) / year
AB-5	L'Anse-à-Beaufils	1990	4,86	60	1.26	120 492	3 543
ABR-1	L'Anse-à-Brillant	1978	1,02	22	4.35	73 767	1 756
G-5	Gascons*	1986	1,52	42	2.29	26 334	1 053
PD-6	Port-Daniel	1989	1,81	41	1.83	82 618	2 581
SG-2	Saint-Godefroi*	1985	3,88	35	0.92	92 835	2 210
ST-4	Sainte-Thérèse-de-Gaspé	1986	2,7	46	2.52	34 242	1 369

‘LOW TECH’ ANNUAL MONITORING

- Hydroacoustic surveys of the seabed
- Completed by the Canadian Hydrographic Service using a boat survey platform and the Kongsberg EM2040C echo sounder

HYDROGRAPHIC SURVEY IMAGES

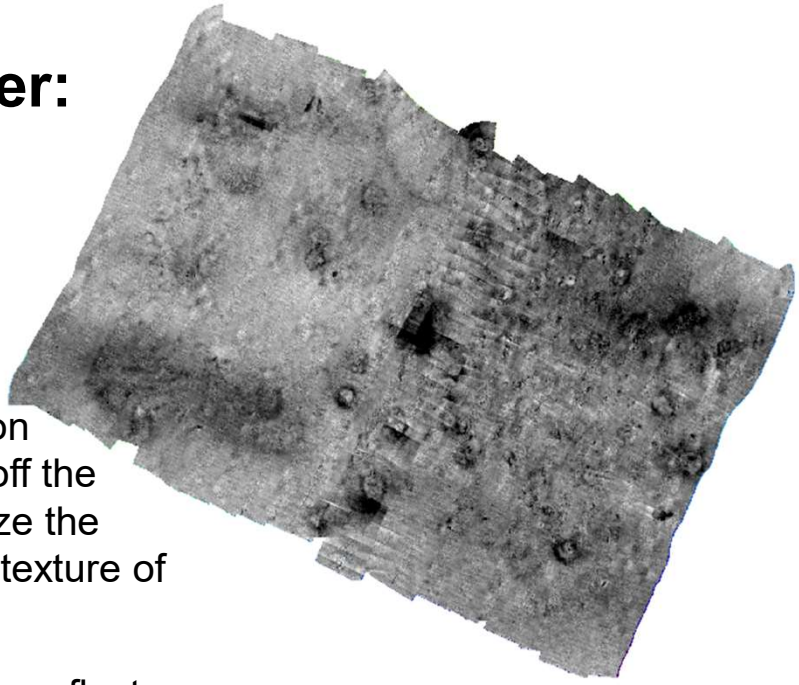
Bathymetry:



Used to map seafloor depth and topography using multibeam echo sounder from a ship.

Data is used to interpret where and how disposal material has settled.

Backscatter:

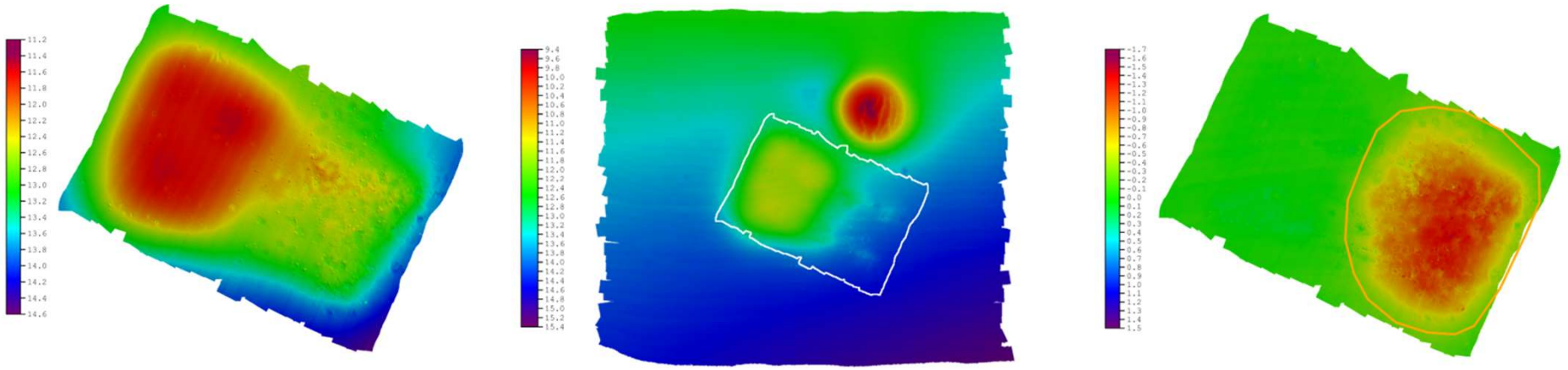


Uses the reflection of sound waves off the seafloor to analyze the composition and texture of the seabed.

Different materials reflect sound waves differently, allowing us to identify and map underwater habitats and geological features.

DIFFERENTIAL CALCULATION BETWEEN ANNUAL SURVEYS

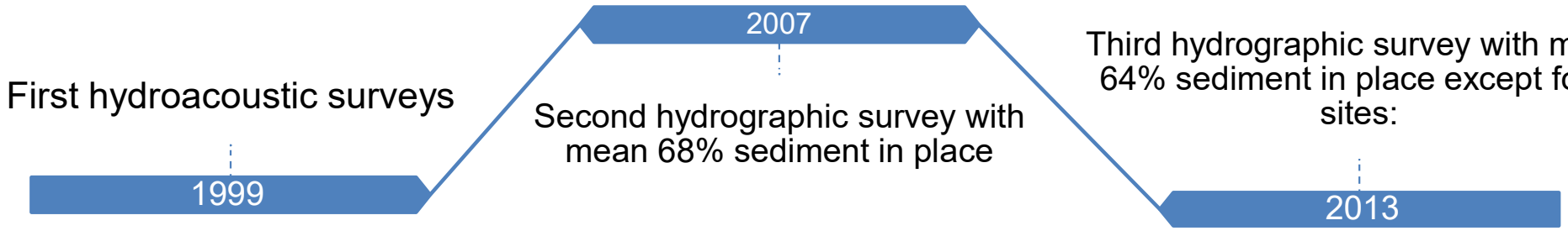
2024 SURVEY MINUS **2023 SURVEY** EQUALS **A VOLUME**



The data processing is carried out in three main steps using the HIPS 11.4.32 software from the Caris suite:

1) the bathymetric data is processed, filtered, adjusted, and validated
2) the vertical adjustment of the final bathymetric surfaces is performed
3) volume calculations are generated using the Engineering Analysis Module (EAM) tool

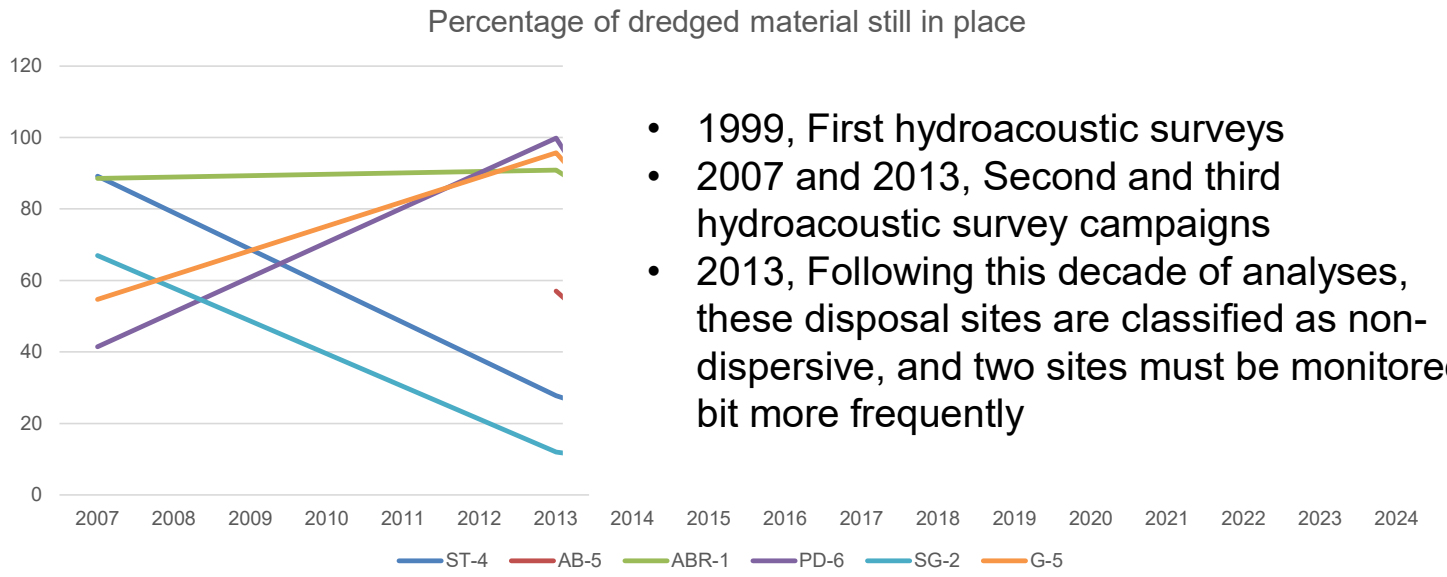
INITIAL UNDERSTANDING OF SITES



Year	1999-2007	2007-2013
Number of surveyed sites	5	6
Number of sites with 0% retention	0	0
Min %	42%	12%
Max %	89%	100%
Mean %	**68%**	**64%**

Gaspésie disposal sites are classified as non-dispersive, but two sites flagged for more frequent monitoring as less than 20% of material was in place

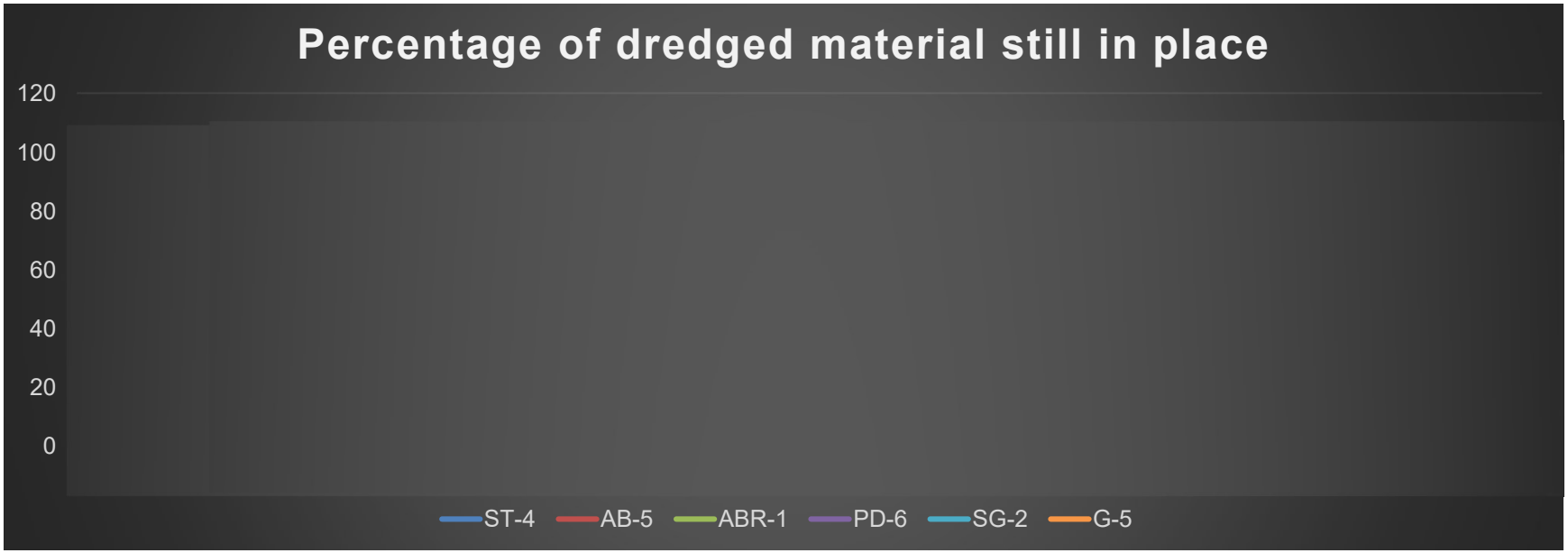
FIRST EVALUATION



- 1999, First hydroacoustic surveys
- 2007 and 2013, Second and third hydroacoustic survey campaigns
- 2013, Following this decade of analyses, these disposal sites are classified as non-dispersive, and two sites must be monitored a bit more frequently

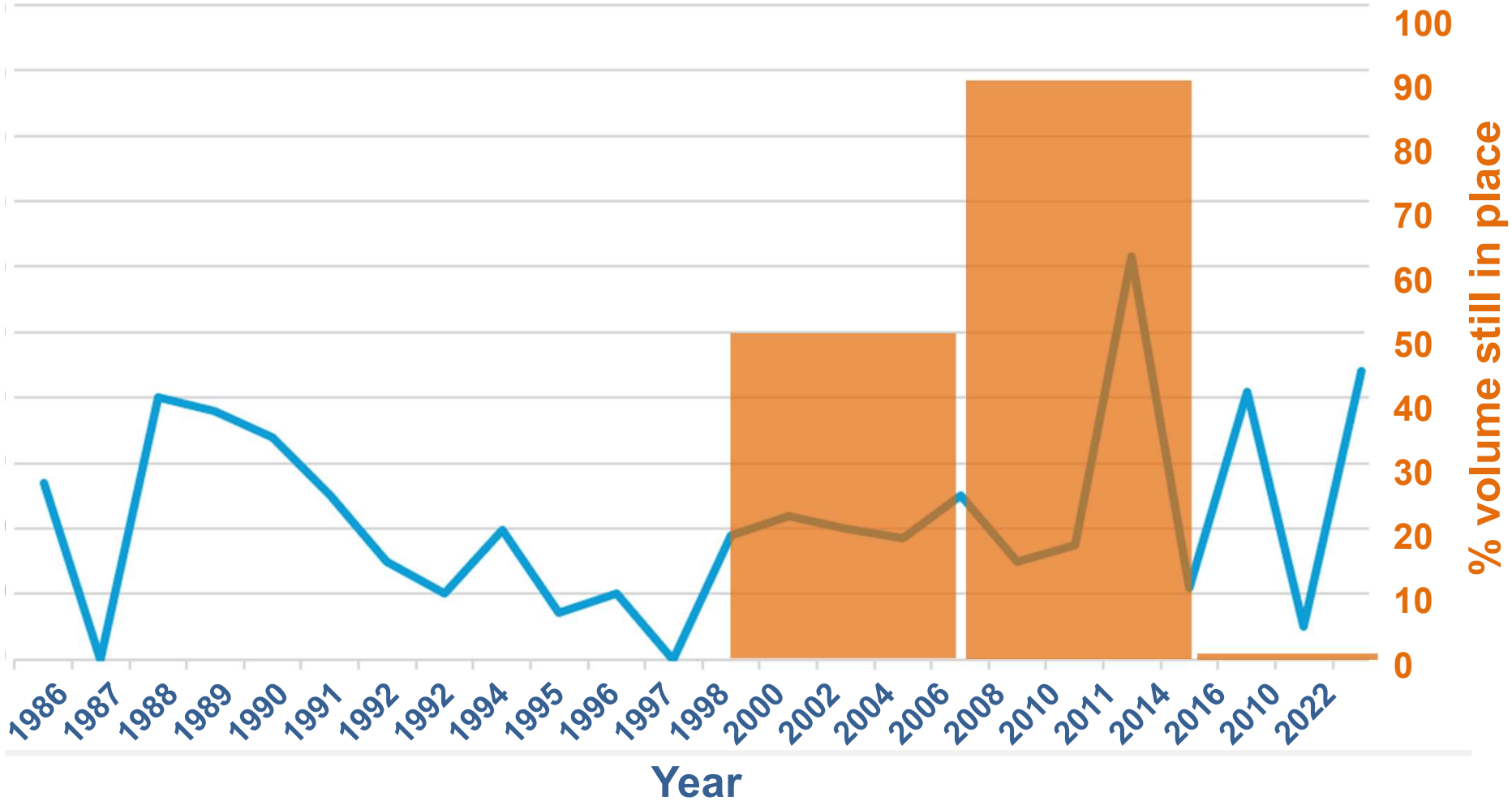
Year	2007	2013
Nb of surveyed sites	5	6
Nb of sites with a 0%	0	0
Min %	41,70%	12%
Max %	89,20%	99,80%
Mean %	68,10%	63,80%

VARIATION ANALYSIS



Year	2007	2013	2016	2017	2018	2019	2020	2021	2022	2023	2024
Number of surveyed sites	5	6	2	3	4	3	4	4	4	3	4
Number of sites with 0% retention	**0**	**0**	**2**	**3**	**3**	**1**	**4**	**2**	**4**	**3**	**1**
Min %	42%	12%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Max %	89%	100%	0%	0%	23%	69%	0%	63%	0%	0%	0%
Mean %	68%	64%	0%	0%	6%	33%	0%	30%	0%	0%	52%

GASCONS (G-5)


100
90
80
70
60
50
40
30
20
10
0
% volume still in place
1986
1987
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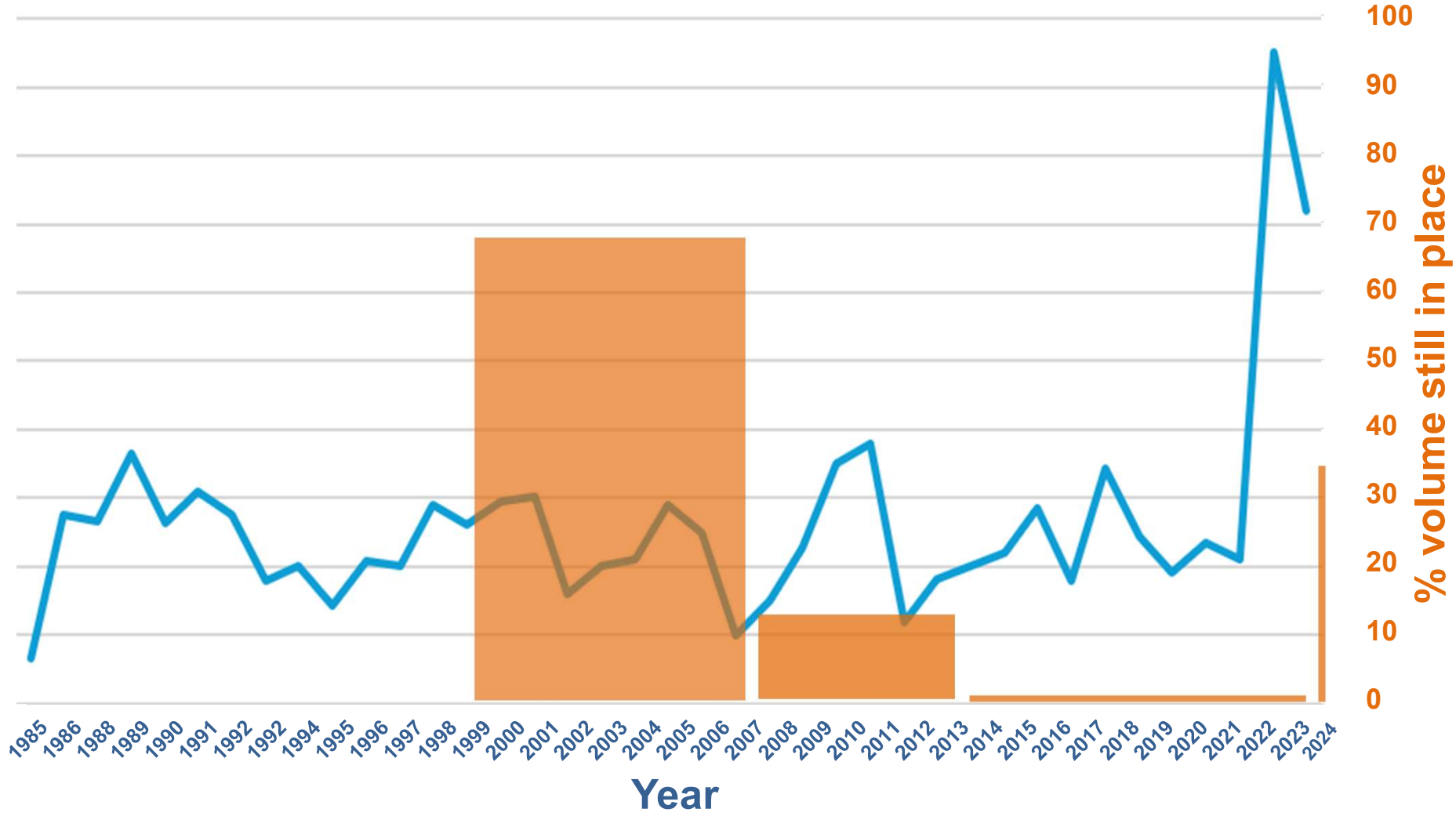
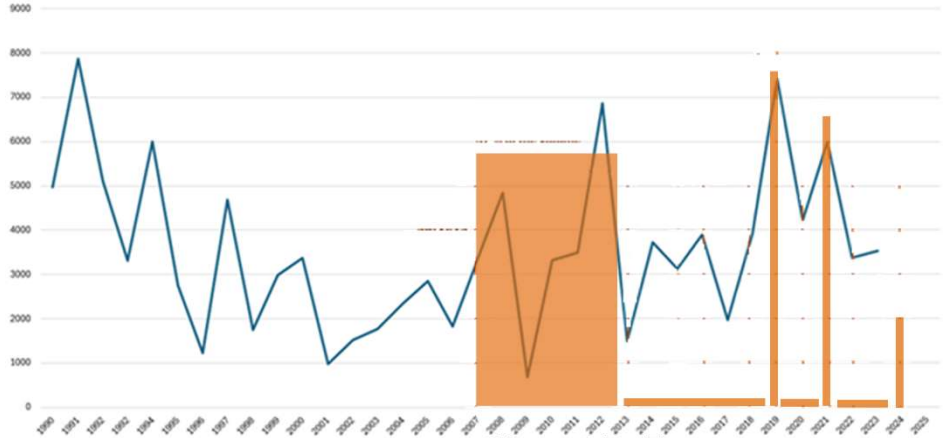
2022
Year

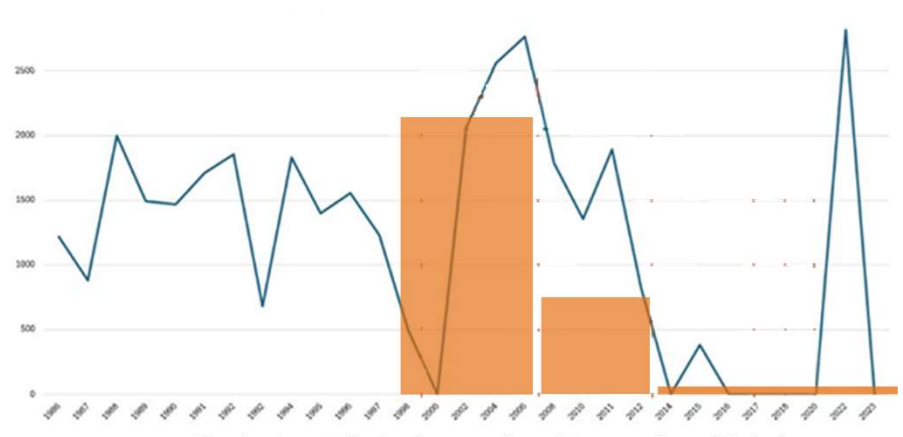
Saint-Godefroi (SG-2)



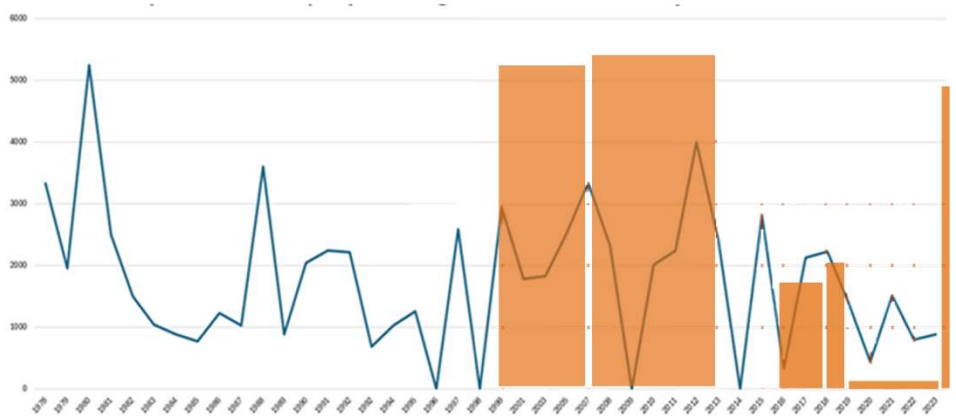
Also see changing trends at four other Gaspé sites:



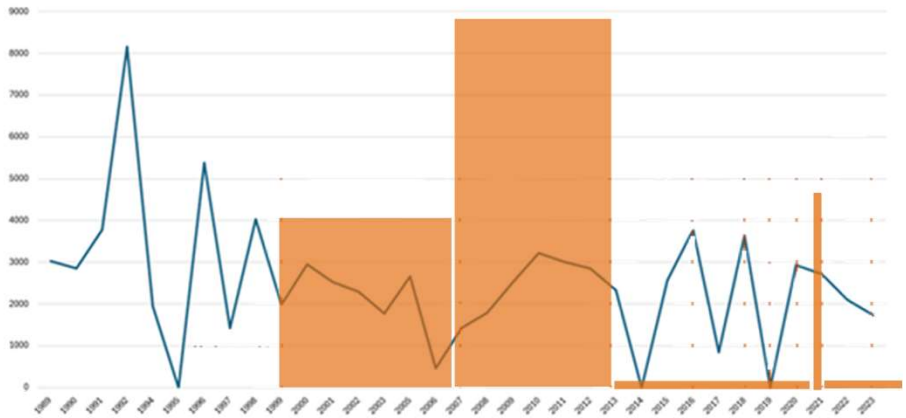
L'Anse-à-Beaufils - AB-5



Sainte-Thérèse-de-Gaspé - ST-4

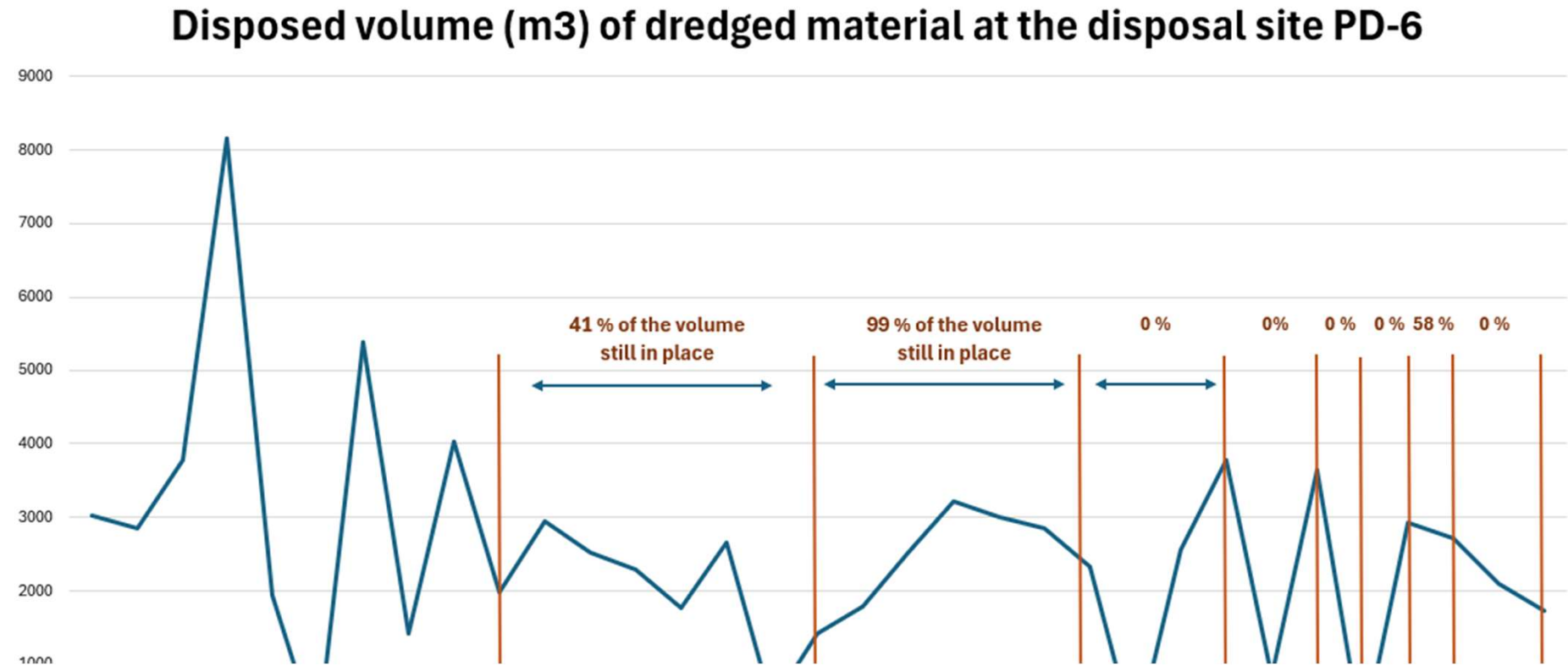


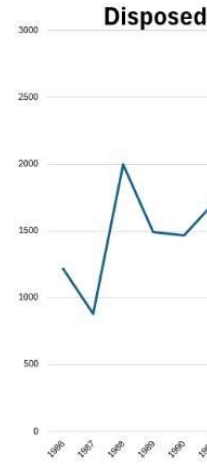
L'Anse-à-Brillant - ABR-1



Port-Daniel - PD-6

RETENTION OF SEDIMENTS AT DISPOSAL SITES





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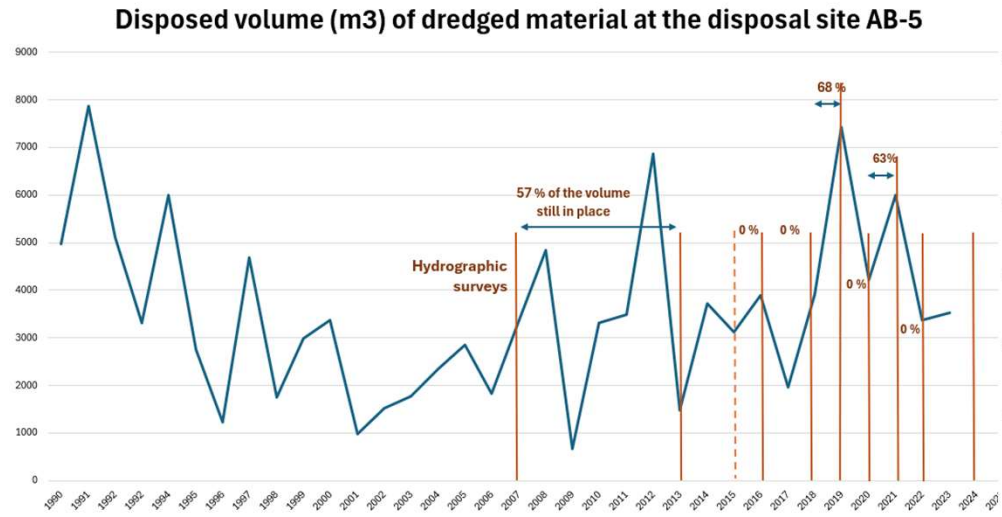

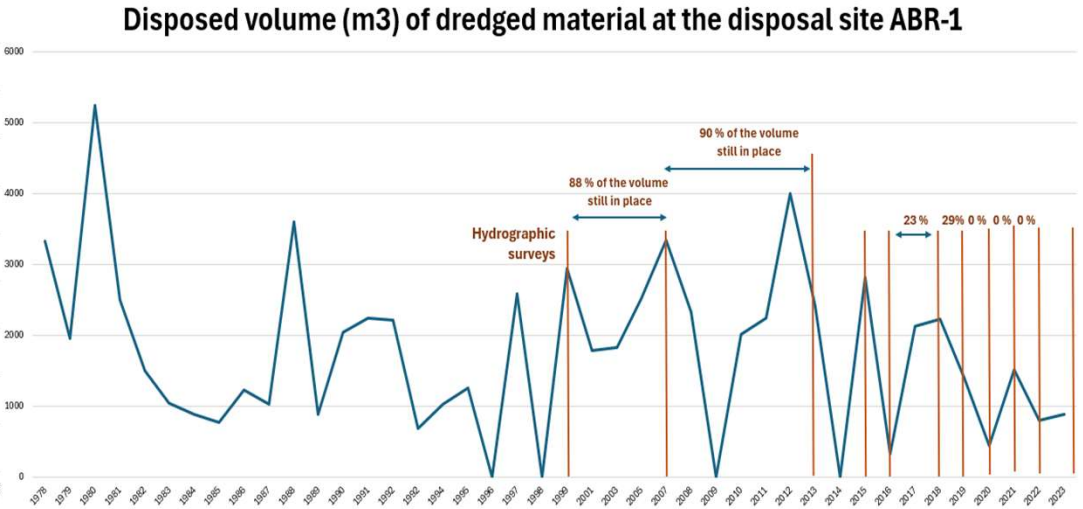

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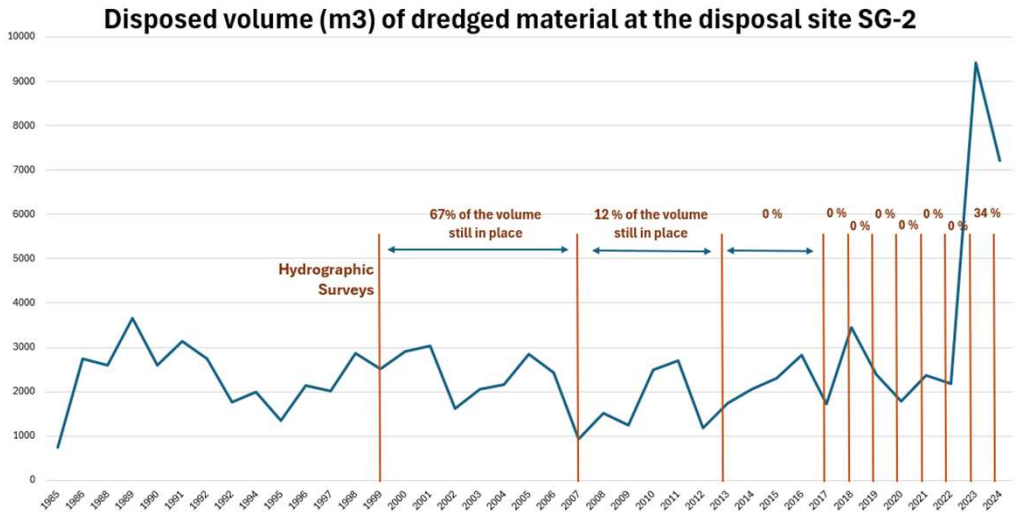

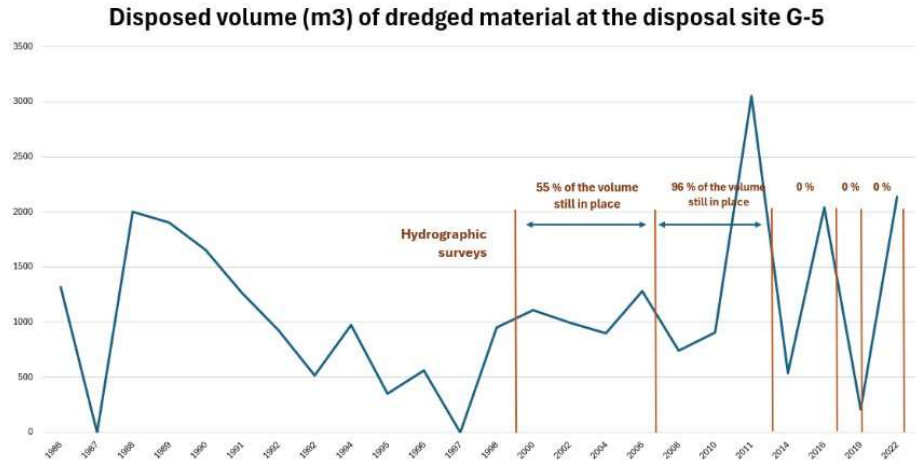

WHAT'S GOING ON?

We thought these sites were non-dispersive … so why the low sediment retention?

Hypothesis: low retention was due to operator error (i.e. material was disposed at incorrect disposal site coordinates).

ACTIONS TAKEN

2018: a compliance promotion visit was conducted with dredge operators

2020: planned site visits and field inspections had to be postponed

2024: a field inspection with our law enforcement officers confirmed that the dredge operators were depositing at the correct coordinates for the 2023 and 2024 operations

The hypothesis of operator error was therefore ruled out.

NEW HYPOTHESES … NEW UNDERSTANDING?

- Have our Gaspésie disposal sites become more dispersive in the past 15 years?

- **New hypothesis** is that **ocean currents have changed over the past 15 years,** particularly those **during winter storms when the disposal site is no longer protected and covered by sea ice**.

- This **change in sea ice cover, driven by climate change, could be affecting ocean currents, making the disposal site more dispersive** than it was in the past.

IMPLICATIONS AND NEXT STEPS

- We now need to test this hypothesis
- In June 2025, an Acoustic Doppler Current Profiler (i.e. instrument to measure bottom velocity) will be installed on the sea floor at the Saint-Godefroi disposal site for one-year to obtain information on the sediment dynamics
- Currently working on a detailed model of currents and ice conditions at these disposal sites over the past decade; results expected spring 2025
- Annual hydroacoustic surveys continue
- Changes in site dispersiveness will be considered during the assessment of future disposal permit applications

CONCLUSION

- The Gaspésie disposal sites have been around for decades, but are not ‘routine’ anymore
- As we continue to investigate the reasons for the changes we are seeing, we wonder if anyone else seeing similar changes that are potentially related to climate change?
- If so, what are you doing to manage these changes?


THANK YOU!