



The DND UXO and Legacy Sites Program

RISK MITIGATION OF MILITARY MUNITIONS IN A SENSITIVE ECOSYSTEM ENVIRONMENT

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DND UXO and Legacy Sites Program

- DND recognized that there was a problem
 - 7 civilian deaths in Vernon BC
 - 1 death and 9 injuries in Lac Saint-Pierre
 - April 2007 serious injury in Rivers Manitoba
- Population encroaching upon former ranges and training areas
- No single entity in DND to address the matter
- Established the DND UXO and Legacy Sites Program in February 2005

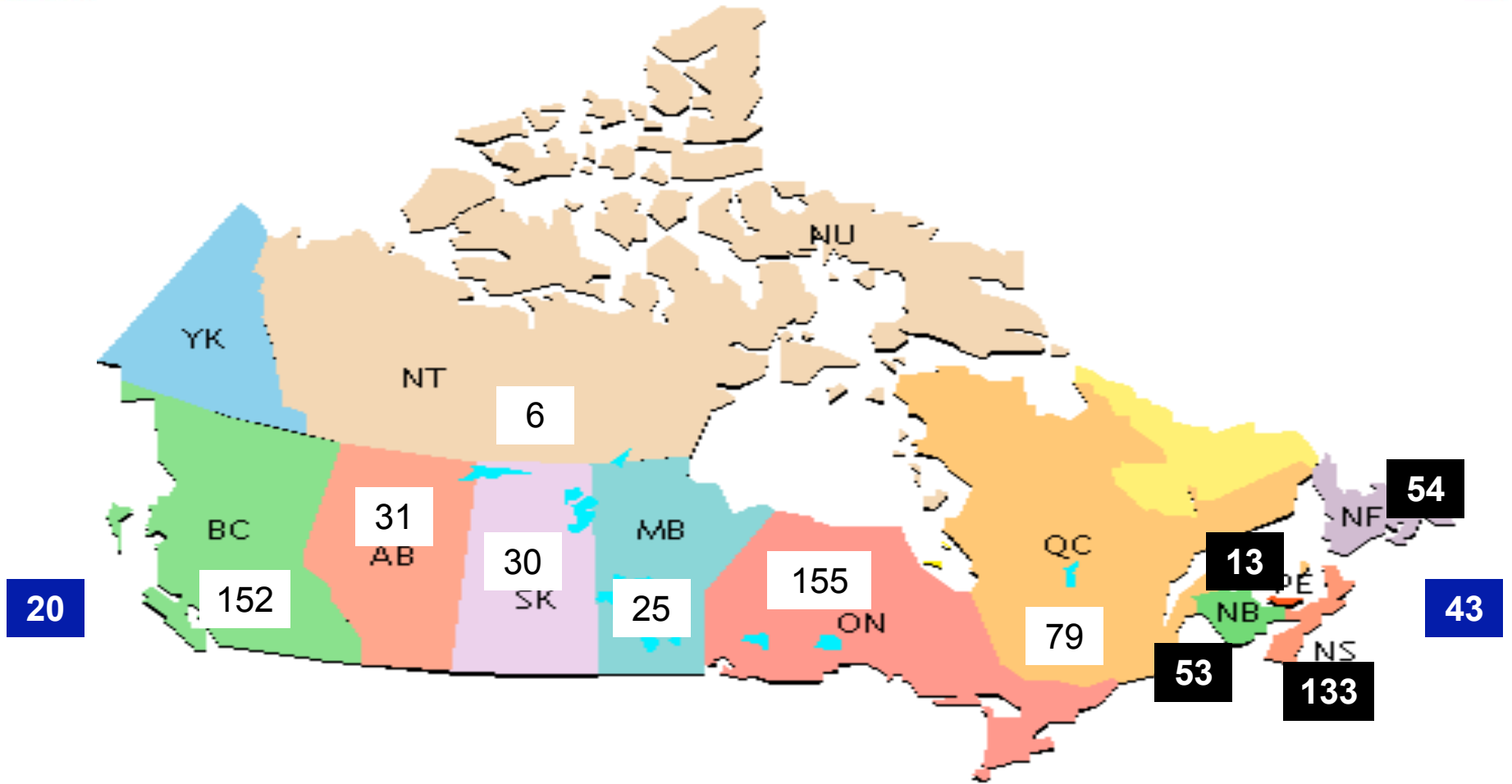


Program Elements

- The direction provided to the UXO Program by senior management included the following components:
 - Research to identify the sites
 - Historical review and follow-up to gather information on site use
 - Assess the sites and prioritize
 - Mitigate the risk
 - Signage and fencing
 - Public information and education
 - Survey and clearance



Sites



731 Potential Land-Based UXO Legacy Sites
63 Priority Offshore Sites



Is UXO and Environmental Issue ?

- In some jurisdictions UXO is addressed through environmental regulation: USEPA
- In Canada UXO is not 'contamination'
- UXO is a Public safety issue
- There are no criteria that allow a UXO affected site to be deemed 'safe'
- UXO sites can never be cleared to 100%
- UXO may result in environmental effects
 - Firing points, impact areas, disposal pits
 - Canadian experience: it is not widespread
- DND cannot transfer liability for UXO



The DND UXO and Legacy Sites Program

The lac St-Pierre project



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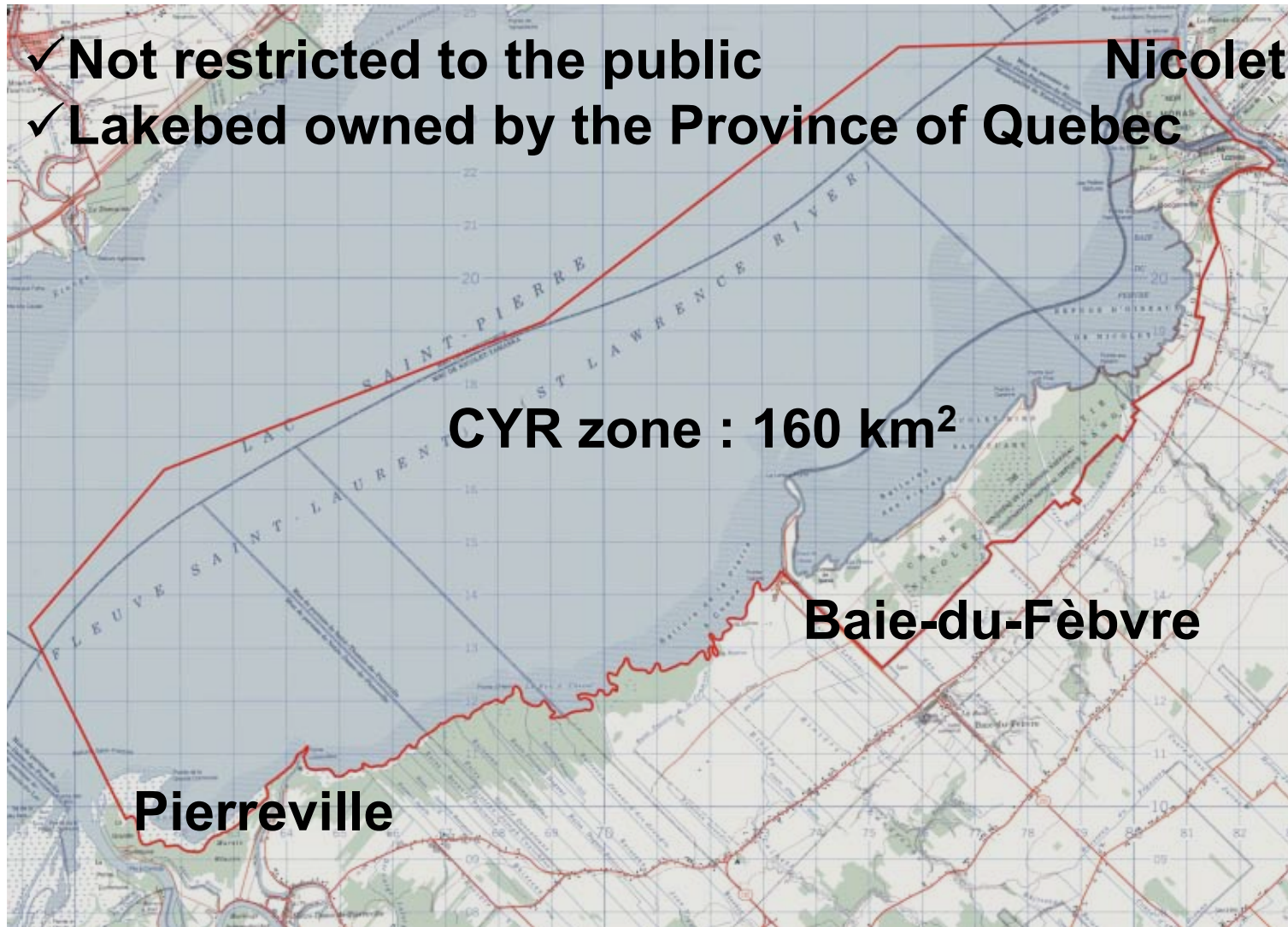
Site description





Range boundaries

- ✓ Not restricted to the public
- ✓ Lakebed owned by the Province of Quebec





Lac Saint-Pierre uniqueness

- **Largest natural flood plain in Quebec**
- **Shallow water depth, shallow gradient**



- **1998 Convention for Wetlands (RAMSAR)**
- **2000 Protected biosphere by UN**





The Lac St-Pierre Project

- To deal with the site three options were examined:
 - Do nothing except respond when UXO were found and maintain institutional controls such as signage;
 - Clear the entire range;
 - Conduct a limited clearance and implement other controls based upon a future land use plan agreed upon by stakeholders.
- A way of comparing options was needed that provided more than a subjective opinion of risk and cost.
- Groupe SM International was engaged to develop a GIS-based risk assessment tool (CSM) to understand the current situation at site and provide a means for future decision making.



The Drivers of Risk

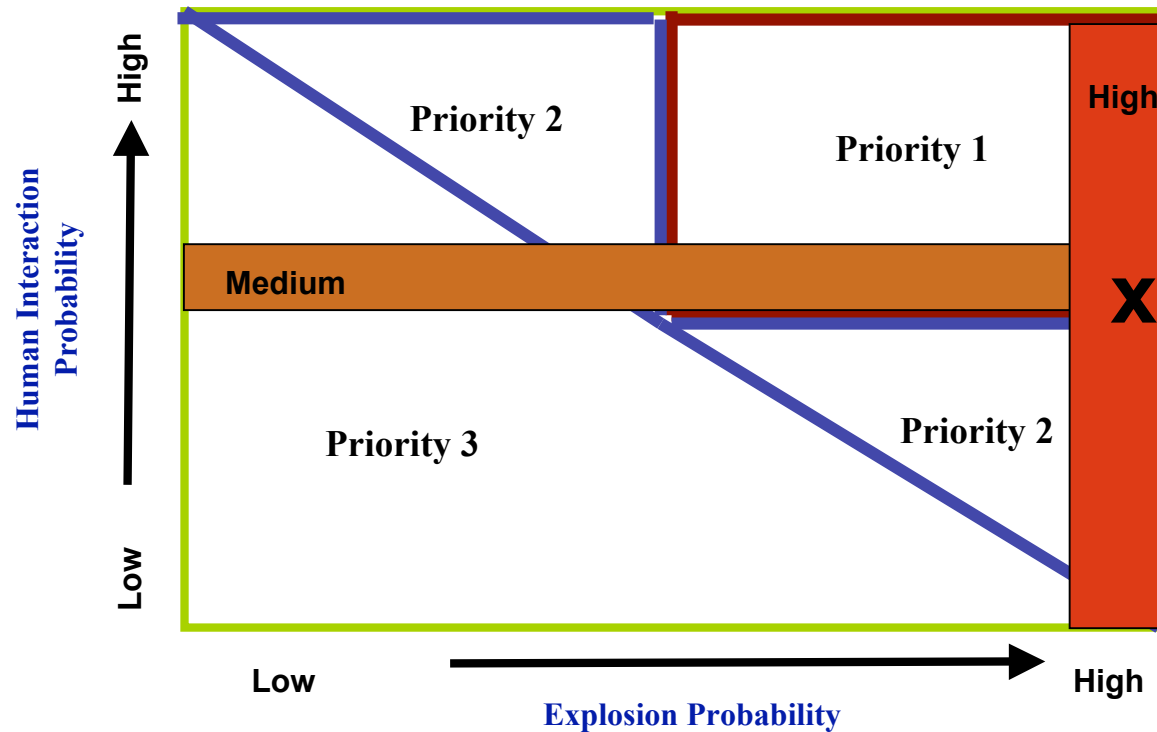
- In planning the GIS certain fundamental goals were established:
 - Risk needed to be presented with non subjective criteria – defensible;
 - The tool needed to be the channel for stakeholder participation such that the final risk map was a collective effort;
 - The tool had to allow for business factors to be applied to aid in seasonal planning and funding requests; and
 - The tool needed to be a *living thing* that allowed for continued input for future years as the site was managed and site conditions changed.



Measuring Risk on a National Level

- On a national level the program uses the following tool to evaluate risk.

Example of a Priority 1 (High Risk) Determination





Measuring Risk at the Site Level

- To measure risk at the site level a third axis has been added to include significant environmental attributes.
- The three axis used in the risk assessment are:
 - Human Interaction;
 - Significant Environmental Attributes; and
 - Explosion Probability
- Each axis is made of individual criteria with specific weightings assigned.



Measuring Risk at the Site Level – Global Risk Index

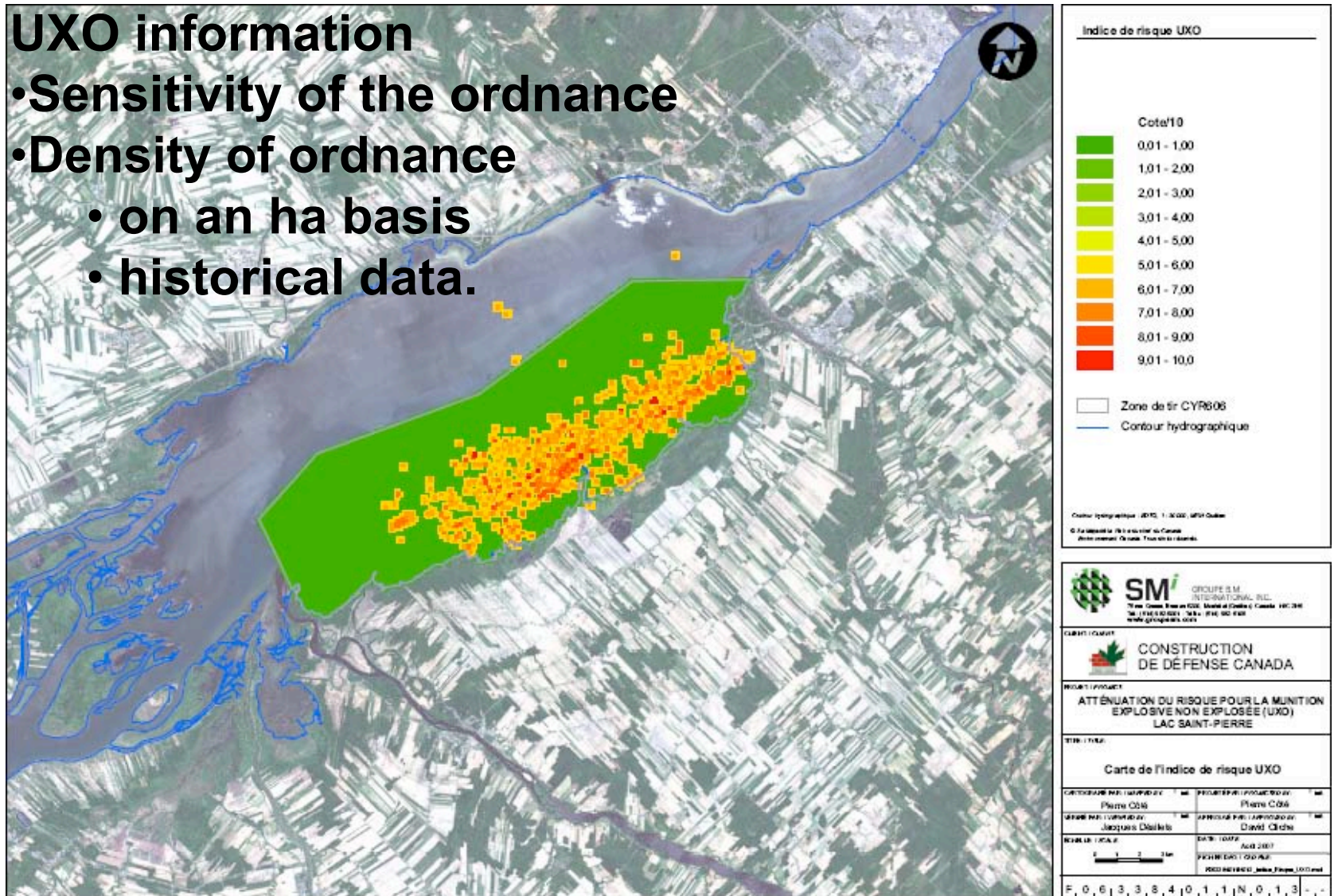
Global risk index $(x^2 + y^2 + z^2)^{1/2}$	17,3
X: UXO probability of explosion	/10
Sensitivity	6/6
Density	/4
Y: Human interaction probability	/10
Likelihood of contact	/3
Type of person involved	/2
Frequency of the human activity	/2
Human density	/2
Type of access	/1
Z: Significant environmental attributes	/10
Bathymetry	/8
Current velocity	/2
Sediments	/-2
Vegetation	/-2



Measuring Risk at the Site Level – UXO probability of explosion

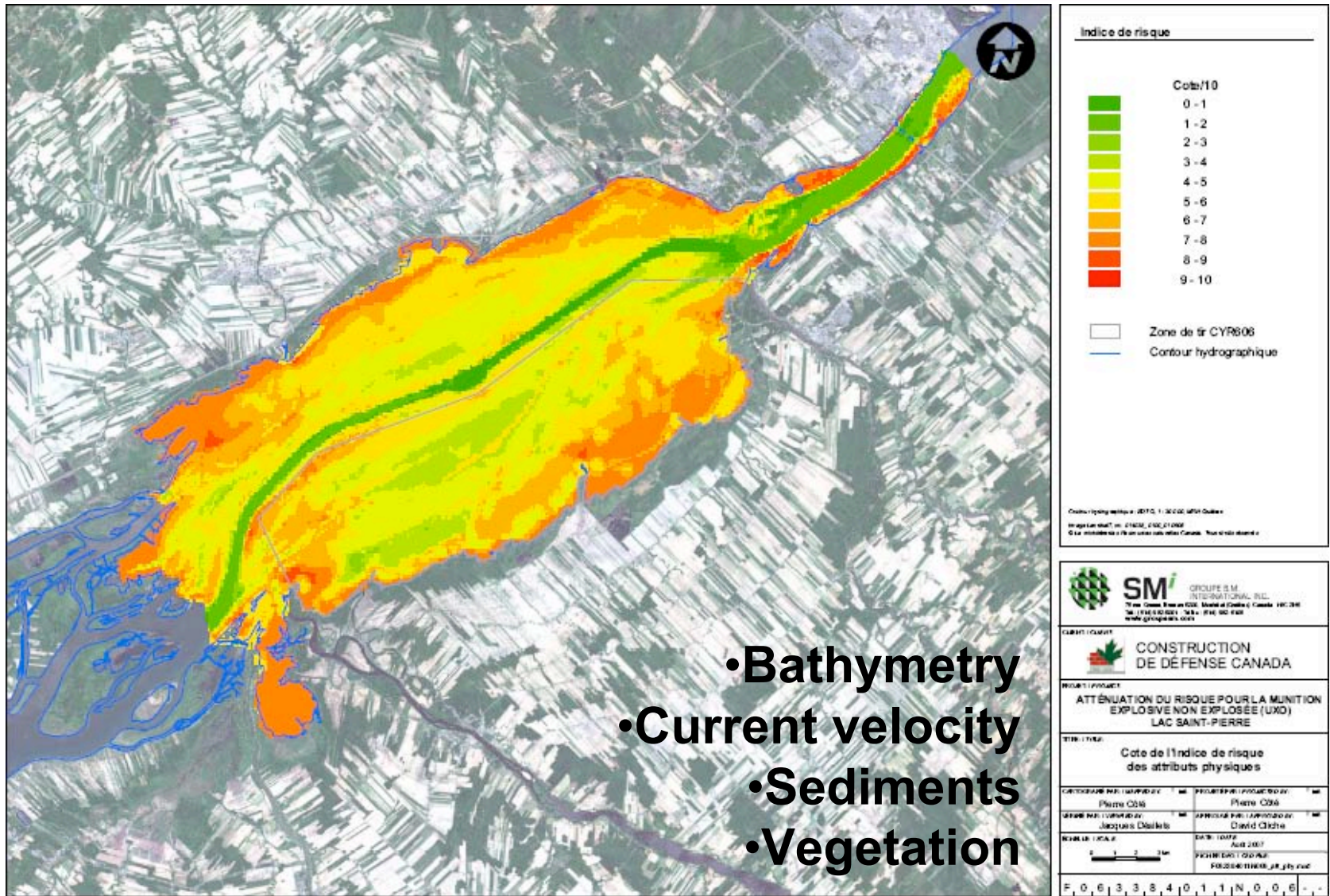
UXO information

- Sensitivity of the ordnance
- Density of ordnance
 - on an ha basis
 - historical data.





Measuring Risk at the Site Level – Significant environmental attribute



- Bathymetry
- Current velocity
- Sediments
- Vegetation



Risk management and mitigation activities

- On-going risk management activities
 - Information campaigns
 - Installation of warning buoys
 - Shoreline sweeps
 - Support to municipalities (dredging, bridge co





Risk management and mitigation activities

- Geophysical surveys
- Anomaly investigation





Risk management and mitigation activities

- Clearance work



Diameter: 2' (61 cm)

Depth: 10''(25 cm)

Volume of disturbed sediment : 0,07 m³



BIS of a 3.5'' projectile (1kg) with 500 grams of C4



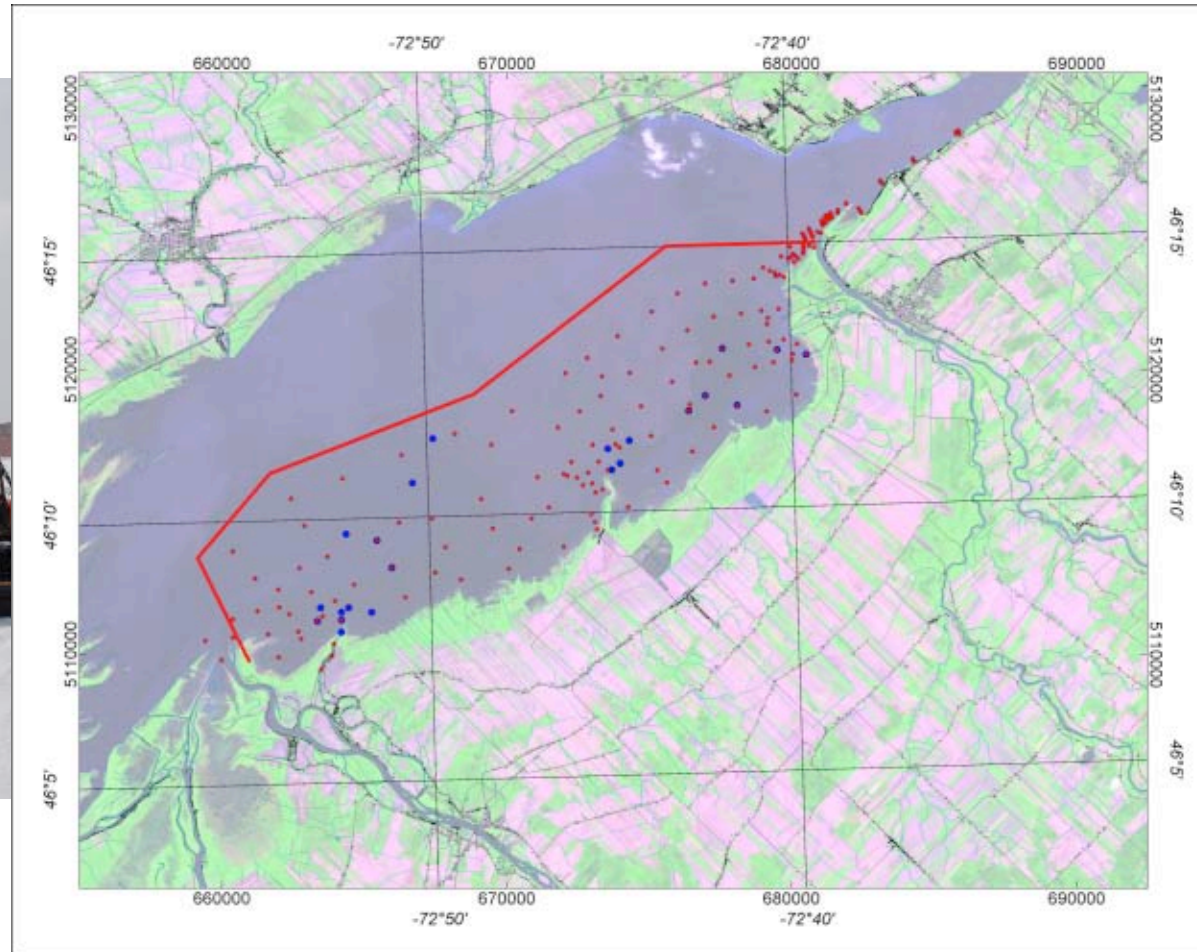
Environmental Assessment

- DND will conduct an environmental assessment (EA) according to the *Canadian Environmental Assessment Act*
- Also subject to the Quebec Environment Quality Act,
- the EA is conducted within a Canada-Quebec collaboration agreement.
- The Canadian environmental assessment agency (CEAA) coordinates the entire process



Environmental Assessment

Sediment quality (190 surface samples, 70 core samples)





Conclusion

- **The developed GIS-based risk assessment tool has given DND a tool to manage future work and meet the mandate of the national program – protecting citizens. This tool will be adjusted annually through continued engagement of the stakeholders.**
- **Stakeholders at all levels will be empowered throughout the entire process and the level of risk is defined by their inputs.**
- **The essential elements that were used to develop the guidelines dealing with the nature, scope and extent of future environmental impact study were, namely:**
 - **Quantifying the risk indices of certain areas;**
 - **Selecting the type of mitigation measure; and**
 - **Selecting the UXO clearance technology.**
- **Risk mitigation of military munitions in a sensitive ecosystem environment is asking DND to balance the protection of people with the protection of the environment while considering the interests of regional economic development.**



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Questions ?



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