

**PUBLIC CONSULTATION PAPER ON BOUNDARIES OF
THE SEA FOR THE OCEAN DISPOSAL PROGRAM**

Disposal At Sea Program

Marine Environment Branch
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Environment Canada

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1. Introduction

When a river empties into the sea, where does the river end and the sea begin? This document outlines proposals for a process to be used in setting boundary lines between the sea and freshwater for the purposes of Environment Canada's Ocean Disposal Program. In particular this process will be considered as it applies to setting the boundary in major estuaries such as the Fraser River estuary in British Columbia, the Mackenzie River estuary in the North West Territories, and the Miramichi River estuary in New Brunswick. Consideration will also be given to how the process would work for areas of brackish water such as the Bras d'Or Lakes in Nova Scotia.

Canada controls disposal at sea by a system of permits under the *Canadian Environmental Protection Act, 1999* (CEPA). CEPA defines the area for application of its ocean disposal provisions as "the internal waters of Canada, excluding all the rivers, lakes and other freshwater in Canada ...". Boundaries between freshwater and marine water are open to interpretation with the exception of the boundary in the St. Lawrence River at Anticosti Island defined in CEPA. As it is set in CEPA, the line in the St. Lawrence is not part of the review undertaken in this document.

Waters in estuaries, bays, and deltas may be saline to varying degrees and are distinct from the freshwater portion of a river. To add to the ambiguity, the limit of freshwater near the mouth of a river is highly variable and is affected by both river discharge and tides. Also, the CEPA definition would seem to include areas of brackish water. The Bras d'Or Lakes, while lakes in name, have open channels to the sea and are brackish rather than freshwater.

The purpose of this document is to assist Environment Canada in choosing a process for setting lines for disposal at sea. These lines can be set in regulation to give clear and transparent limits to the disposal at sea permit process. Clients of the Ocean Disposal Program would have a defined boundary so they know when CEPA would apply to their projects. Environment Canada's Ocean Disposal Program and enforcement staff would know where to apply ocean disposal controls. Finally, it is helpful for other regulatory bodies to know where ocean disposal provisions would be applied.

Currently, in the absence of regulatory lines, there are two administrative boundary lines defining the limits of application of CEPA in use in rivers on the Atlantic and Pacific coasts. In the Fraser River, CEPA's ocean disposal controls are applied seaward of lines drawn at Annacis Island in the Main Arm and at Mitchell Island in the North Arm (figure 1, line A). In the Miramichi River there is an administrative boundary line drawn at the Chatham Bridge (figure 3, line A). In order to be clear and transparent Environment

Canada wishes to develop a method of setting lines in these and other estuaries that is consistent, rational, and scientifically and legally defensible.

An additional consideration in the need for boundaries and the placement of boundaries is what other equivalent controls are already in place. Environment Canada's main goal remains the protection of the environment from disposal activities but would seek to reduce duplication wherever possible. A survey of environmental controls in freshwater reveals inconsistencies in the approach to the protection of the aquatic environment from dredging and disposal activities. As estuaries, deltas and brackish waters are critical ecosystems, Environment Canada will seek the approach that encompasses the greatest extent of the estuarine environment.

The purpose of this document is to seek regulator, government, client, and non-governmental views on the best option for setting boundaries. The document will be followed by consultation meetings across the country in early 2003. Written comments should be sent before February 15, 2003. If you would like further information or you would like to come to a consultation meeting, please contact:

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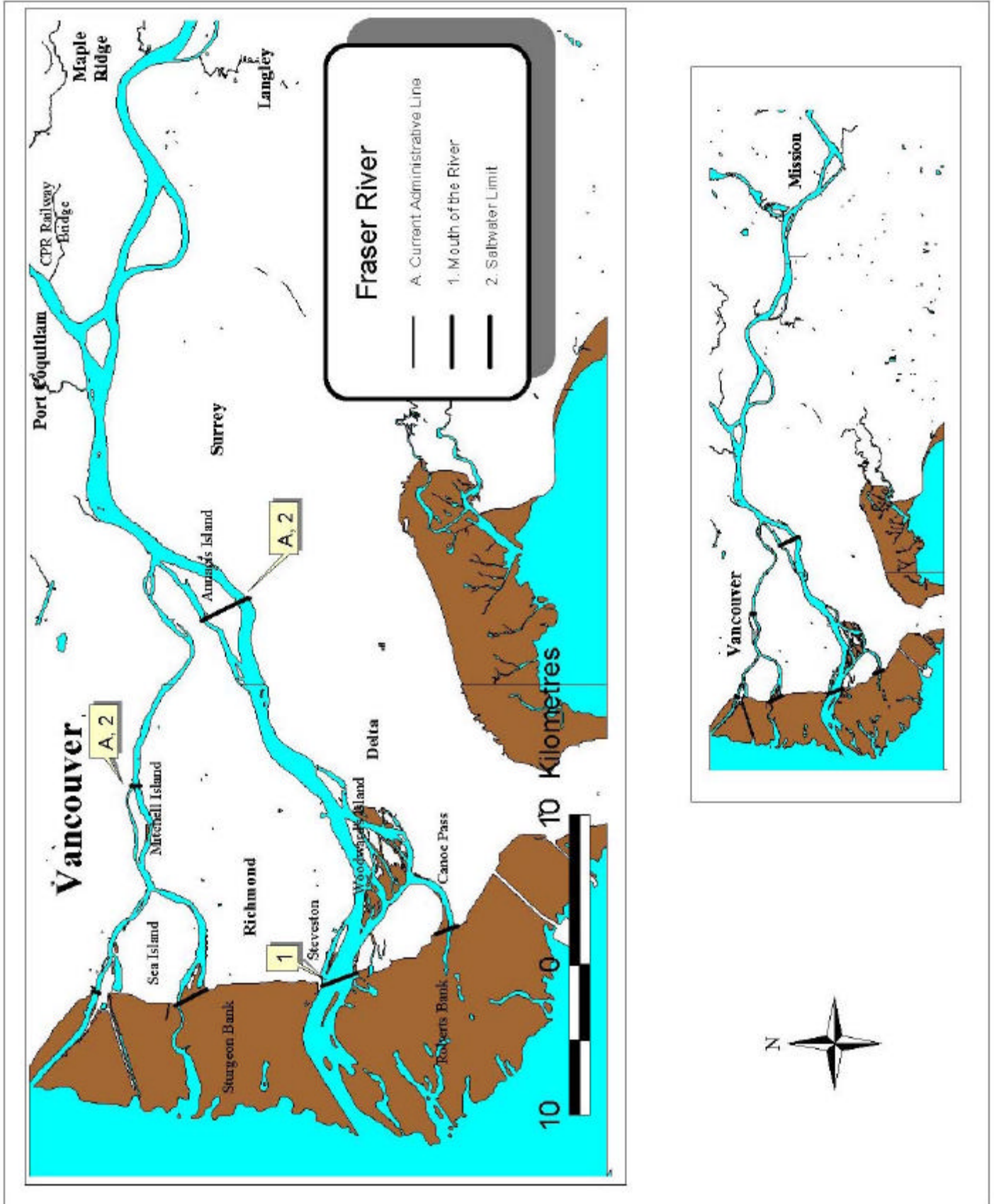
2. Identified Options

Environment Canada has identified a number of possible methods for determining the boundary between fresh and salt waters. Each of these options has been evaluated against a set of criteria as described in Appendix A. The following section describes each of the two workable methods and the resulting lines that would be generated by each method.

2.1 Mouth of the River

The baselines of the Territorial Sea are set by drawing lines between major headlands and are the baselines from which Canada's 12 and 200 nautical mile limits are measured. These lines are set by order under Canada's *Oceans Act*. All waters inside these lines are defined as internal waters. The lines are drawn as far out to sea as possible in order to

Figure 1 - Fraser River



maximize Canada's Territorial Seas and Exclusive Economic Zones. Since Canada regulates disposal at sea within its internal waters, as required under CEPA and encouraged under the 1996 Protocol to the London Convention, these baselines are not useful for setting boundaries for the purposes of the Ocean Disposal Program.

A similar approach to that used for setting the Territorial Sea Baselines could be used to define the boundaries of the sea, but would use minor headlands, at high tide, at the mouth of the river. This would involve developing a definition of minor headlands at the mouth of the river and drawing a line between them for use as the boundary of the sea.

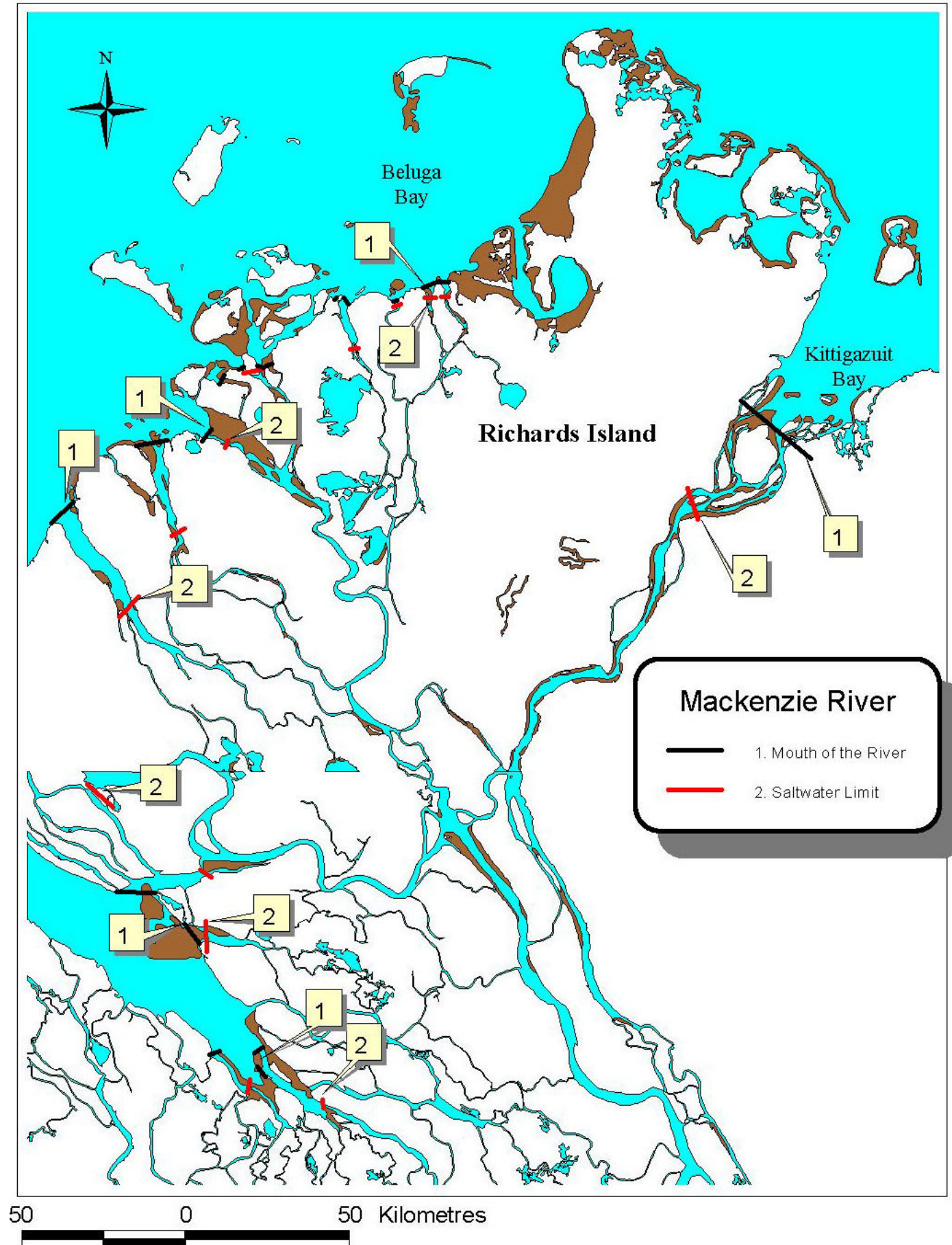
This method would place boundaries as close to the recognizable mouth of the river as possible. In the Fraser River the line could be drawn in the Main Arm at Steveston and in the North Arm at the westernmost points of Sea Island (figure 1, line 1). On the Mackenzie River the lines could be drawn from the points of maximum seaward land at the end of each unbroken river channel (figure 2, line 1). In the case of the Miramichi River, the major flaw in this system can be seen as the River channel expands gradually into Miramichi Bay. The choice of headlands to use would be fairly arbitrary, with one option shown in figure 3, line 1.

Using this method would result in the lines being moved seaward from the current administrative lines on the Fraser and Miramichi, but not for the Mackenzie or the Bras D'or Lakes. In the case of the Fraser Delta this would remove four small disposal sites from control under CEPA. Clients on the Fraser have expressed a preference for this option as it would free them of the necessity of applying for a permit, doing the analyses and paying the fees associated with disposal at sea controls. No clients would be affected on the Miramichi as we are not aware of any dredging occurring in that river for at least the past five years. Some future dredging however is anticipated, and this would not be controlled under Disposal at Sea. This method could be applied to other estuaries, as it requires only a negotiated agreement of where the line would be placed. This process would exclude the Bras D'or Lakes from disposal at sea controls, which would represent no change from the current practice. As the method draws lines across channels entering the sea, lines would likely be drawn at St. Peters Canal and St. Andrew's Channel (figure 4).

Advantages

- Simple, and nationally applicable
- Inexpensive as no data are needed
- Favoured by some clients as those deregulated will pay less for fees and assessment

Figure 2 - Mackenzie River



Disadvantages

- No scientific basis
- Will remove some clients from disposal at sea control
- Will not control brackish water
- Will not cover the maximum extent of the estuaries

2.2 *Maximum Extent of Salinity*

The location of the transition between fresh and salt water in a river is affected by a number of factors including riverbed structure, tidal conditions, the level of freshwater discharge, season, and climatic conditions. Using salinity to define a boundary line therefore requires the setting of some baseline conditions under which the limits of salinity will be measured. One such approach is to measure salinity at low flow and high tide, as a means of determining the maximum extent of salinity intrusion in the river and therefore the maximum upstream extent of the estuary. Care must also be taken to use data that has been collected at various depths at each sampling point in order to account for stratification that occurs in many estuaries. Freshwater is generally considered to be any water that contains less than 0.5 parts per thousand of salt¹.

In the Fraser River the maximum reach of salt water occurs at Annacis Island in the Main Arm and at Mitchell Island in the North Arm (figure 1, line 2). In the Mackenzie River sea ice prevents the intrusion of salt water into the river channels during low flow (winter) conditions. Boundaries could therefore be set at the mouths of the river channels (figure 2, line 2), as the actual transition from fresh to salt water would occur out at sea beyond the river mouth. In the Miramichi River the maximum extent of salinity, measured in mid August, is about 20 km upstream of the confluence of the North West Miramichi and the South West Miramichi (figure 3, line 2). Even in late May, just after peak flow, the salt wedge reaches to the confluence of the N.W. and S.W. branches.

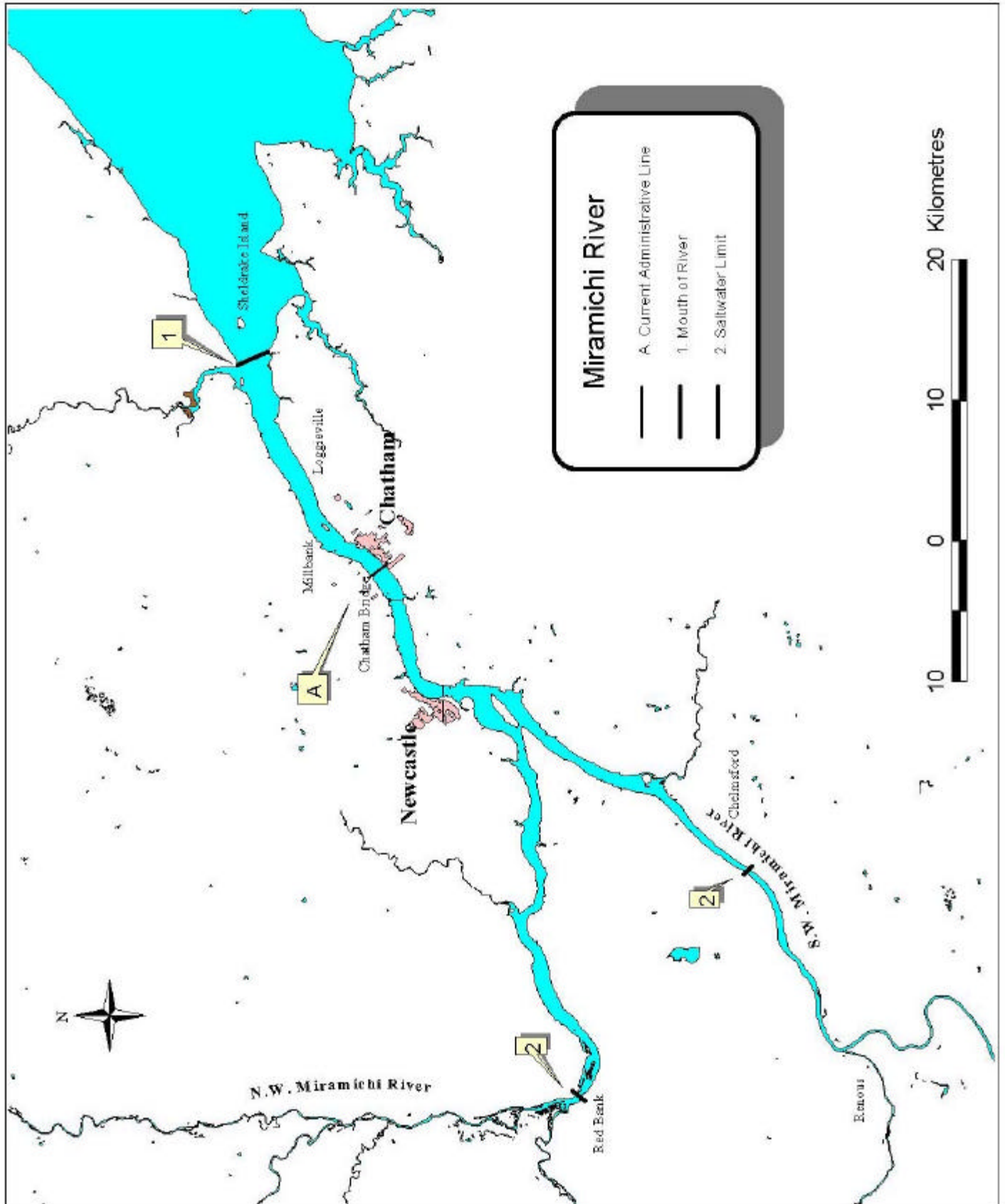
There is salinity data available for a number of other rivers, such as the Saint John River, the Skeena River, and the Squamish River. Salinity data however, is not readily available for all rivers, and significant data collection costs could arise if boundaries need to be set on rivers where data does not currently exist.

To be easily identifiable by clients and enforcement officers the salinity information should be coupled with a clear landmark. In earlier consultations other regulators suggested, based on the precautionary principle, using the first recognizable upstream landmark. If no landmark is readily available, it may also be possible to simply rely on Global Positioning System (GPS) navigation equipment, which is now in widespread use and request clients to use this to identify when they have crossed the line.

In the Fraser River the recommended process would produce no change from the current

¹ The salinity of freshwater is usually between 0.1 and 0.5 g/l. Wetzel, Robert G. Limnology. Saunders College Publishing, Philadelphia. 1983.

Figure 3 - Miramichi River



administrative boundary at Annacis Island and Mitchell Island. There are currently four small disposal sites between the current administrative line (same as the proposed salinity line) and the mouth of the river, and these would remain under the jurisdiction of Environment Canada's Ocean Disposal Program. In the Miramichi River the line would be placed at Red Bank in the S.W. Miramichi and just north of the confluence of the S.W. and N.W. channels in the N.W. Miramichi. There has not been any dredging in the river since 1995, so no impact on dredgers is expected. In the Mackenzie the salinity boundary is very close to the physical mouth of the River channels at the end of the delta, and if combined with a landmark, the mouth of each channel would likely be used. Again, no dredging is presently underway in this area, although future activity is possible as oil and gas activities increase.

Main bodies of the Bras d'Or Lakes would be included as they are saline enough to be included under the definition of salinity (0.5 parts per thousand) used in the maximum extent of salinity method (figure 4). Lines would have to be determined for tributaries of the Lakes. In the Bras d'Or Lakes most tributary streams are very small and are on fairly steep terrain, and the boundary would effectively be at the point of entry of the stream into the Lakes. Other brackish waters could be considered on an as needed basis. It is our understanding that some dredging and disposal activity is occurring in the Bras d'Or Lakes, therefore the impacts on clients of a regulatory line would need to be examined.

Advantages

- Science based and meets CEPA definition of the sea
- Maintains current controls
- Data are available for all four areas of interest
- Protects the maximum extent of estuaries
- Will control brackish water

Disadvantages

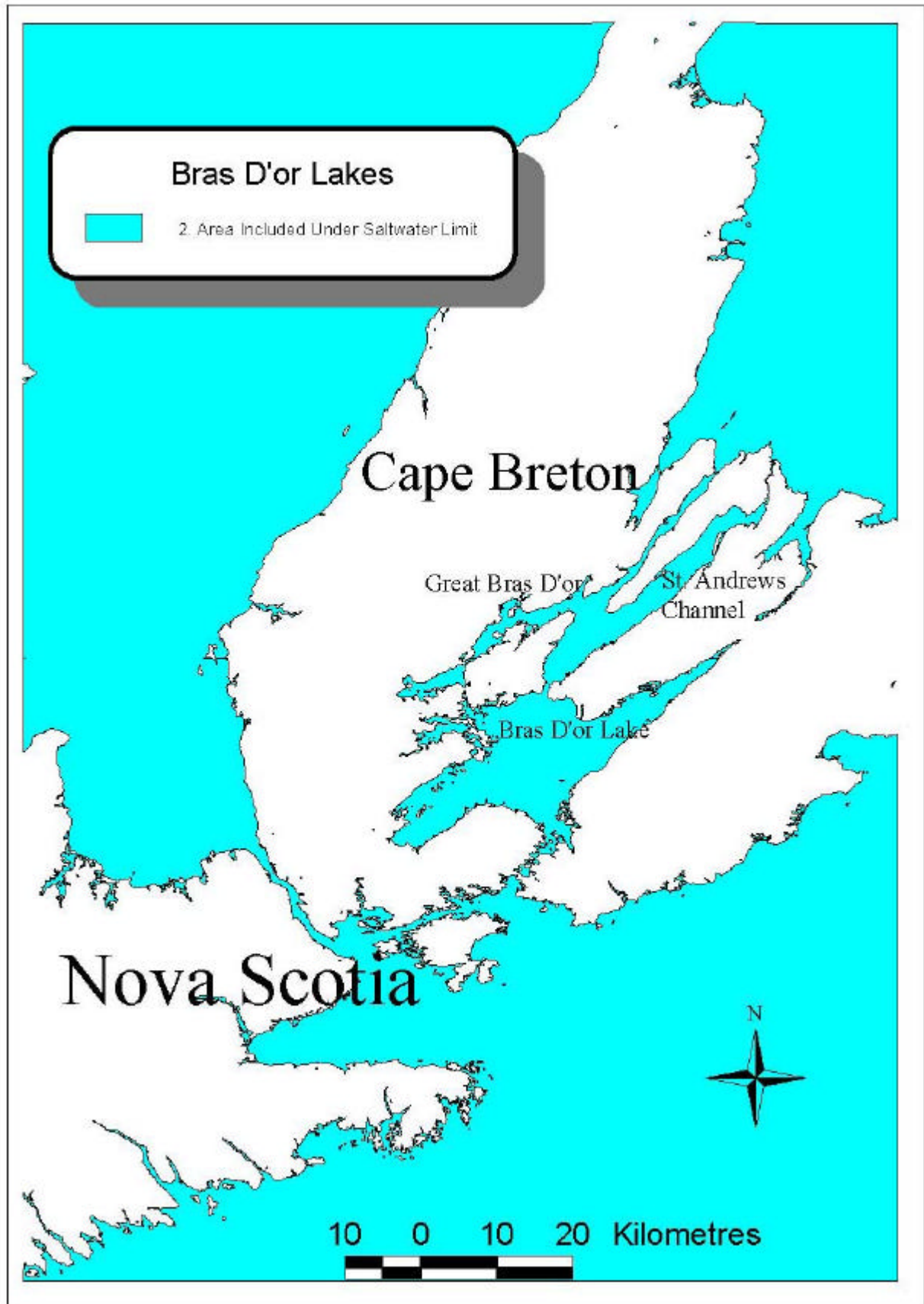
- New estuaries for which data are absent could be costly to implement
- Some dredgers and disposers in the Bras d'Or Lakes could face greater fees and assessment costs

3. Recommendations

3.1 Preferred Option

Based on the available data, as presented, the two options described are feasible for determining the boundaries of the sea for the Ocean Disposal Program. Options that were not selected are outlined in detail in Appendix A.

Figure 4 - Bras d'Or Lakes



Environment Canada's preferred option is using the maximum extent of salinity in the river. The setting of boundary lines based on the maximum upstream extent of salinity in a river is practical, affordable, and enforceable. The maximum extent of salinity is also the method that comes closest to including the full extent of the estuary. Its advantage over the mouth of the river method is that it is scientifically defensible based on a salinity definition of the estuary and includes brackish waters.

4. Future Steps

This paper is part of a larger consultation process. Environment Canada has already received input from other administrative and regulatory entities with an interest in the management of marine and freshwater environments. Other regulators contacted to date on the first draft of this document were in favour of a salinity based approach, with the exception of those regulators that were also fee paying clients who preferred mouth of the river options. A full summary of our consultation responses will follow our nation wide meetings. With this document, we are seeking input from clients, environmental organizations, aboriginal groups, and other concerned citizens with an interest in the management of ocean disposal. Readers are encouraged to comment on all aspects of the document.

The consultation process will also include public meetings in areas across the country. A consultation report, incorporating the results of the public meetings and written submissions, will outline the final recommendations for a process to set boundary lines and in what estuaries and other water bodies the process will be applied. The final document will be distributed to all individuals and organizations involved in the consultation process.

If the final boundaries or the process are to be set in regulation the results of the consultations will be incorporated into a Regulatory Impact Analysis Statement (RIAS) along with a more detailed assessment of the potential impacts of setting boundary lines. Regulations would be published in Part I of the *Canada Gazette* to afford the public an additional 60 days in which to comment on the proposed wording before the regulations become law.

Appendix A - Other Options Considered

a) Point of entry into delta or where river first begins to widen into an estuary

The Point of widening or entry is a strictly geographical method of setting the boundary line, where one would determine the point at which the river first widens or branches into a delta or estuary. In the case of a river without a delta, the point at which the river begins to expand into a funnel shaped bay or estuary would be used.

This method could result in the inclusion of significantly more of the river than just the estuary. For example this method would put the line on the Mackenzie River several hundred km from the mouth of the river. This would mean that the line would not correspond with the definition of the sea in CEPA as it excludes freshwaters. In the Fraser River, the point of branching into the delta occurs just upstream of Annacis Island, roughly at the point at which salinity can first be detected in the river. In the Miramichi the line would be placed 10 km downstream from the Chatham bridge, a point in the river where water is saline under all flow and tidal conditions, thus protecting significantly less than the entire estuary.

b) Unidirectional flow/tides

The point at which tidal influences can be easily detected in a river is far upstream of the furthest point of detectable salinity. For example, in the Fraser River, tidal influence can be detected as far upstream as Mission. In the Miramichi River, the tidal limits are in the northwest and southwest branches of the river. In the Mackenzie River, tidal influence is low, and does not significantly affect the river. Tidal influence is used in setting the fisheries regulations boundaries discussed below.

Unidirectional flow is an approach that sets the boundary between river and marine waters as the point where channel flow is in one direction, downstream, under all tidal and seasonal conditions. This approach, as with tidal measures, would extend the definition of the sea significantly upstream from current boundaries. Most flow data found in literature comes from established hydrographic stations and full river flow profiles throughout the year are not generally available. Locating the precise point of unidirectional flow would therefore be difficult even for the rivers in question in this document. Both of these are thought to be beyond the current wording of CEPA's definition of the Sea.

c) DFO lines

The Department of Fisheries and Oceans has established freshwater/marine boundaries in most rivers on the east and west coasts. These boundaries are based on the extent of tidal influence, as the federal government has jurisdiction over fisheries in tidal waters while non-tidal waters are delegated to the provinces. Schedule II of the *Maritime Provinces Fisheries Regulations* lists the boundary lines for most rivers in the three Maritime provinces. For ease of administration, most of these lines are set at easily recognizable

geographic features such as a highway or railway bridge located close to the head of tide. In the case of larger rivers the boundary is located a significant distance upstream of the mouth of the river. In the case of the Miramichi River, the boundaries are in the northwest branch at the downstream end of Scott's Rapid Pool and in the southwest branch at Oldsquaw Rock, above the mouth of the Renous River.

In the west, the *Pacific Fishery Management Area Regulations* define fisheries management areas under federal jurisdiction. The boundary between the provincial waters of British Columbia and the downstream DFO statistical area 29 is the Canadian Pacific Railway bridge at Mission.

The lines identified in the *Maritime Provinces Fisheries Regulations* and the *Pacific Fishery Management Area Regulations* provide a set of existing, recognized lines that could be used for ocean disposal purposes. These lines in both the Miramichi and Fraser Rivers are far upstream of current administrative lines. There is, however, no equivalent set of lines established for rivers flowing to the Arctic Ocean or Hudson Bay. As well, the use of these lines would likely fall outside of our authority under CEPA as they would include some freshwaters.

d) Port boundaries

Port Authorities are entities created under the *Canada Port Authority Act* to manage Canada's larger marine ports. The boundaries for these Port Authorities are set under the Act.

Port boundaries have been suggested as a boundary line for ocean disposal purposes. The area under jurisdiction of the Port Authority could either be included or excluded from CEPA. In the Fraser River for instance, inclusion of the Fraser River Port Authority would put the boundary of the sea a short distance upstream from the confluence of the Pitt and Fraser Rivers. This approach would include under CEPA controls an area that can reasonably be expected to require dredging and the disposal of dredged materials. The Port Authority's area could also be excluded from the definition of the sea. With this approach, the definition in the Fraser would exclude the entire River and the Waters of the Roberts and Sturgeon Banks, as well as parts of Boundary Bay, thus excluding parts of the sea defined in CEPA.

Port boundaries do not exist, however, in all situations and are therefore not useful in terms of developing a consistent national methodology. Most relevant to this exercise, there are no port authorities on the Mackenzie and Miramichi Rivers or at their mouths or on the Bras d'Or Lakes.

e) Maximum extent of Freshwater in the River

Another salinity-based method of setting a boundary is to use the maximum extent of freshwater in a river. This would be determined by finding the location of first detectable salinity under high-flow conditions at low tide. A level of salinity would be chosen as a

threshold level (0.5 parts per thousand) and measurements would be required at different depths in order to account for estuary stratification.

In the Fraser River, salt water extends only as far as Steveston at the mouth of the River under high-flow/low tide conditions. In the Miramichi, freshwater extends as far as Sheldrake Island in surface waters in May runoff flow. Salt water is detectable, however, at the bottom of the river at Millbank, two kilometres downstream of the Chatham Bridge. In the Mackenzie River under high flow conditions salt water is unable to breach the sand bar barrier islands and does not enter the delta channels. Lines would essentially be the same as the salt water limit lines.

As with other salinity-based boundaries this method would require lines that are easily recognizable for clients or enforcement staff. A landmark-based line would therefore be set if GPS technology use is not deemed practical. Data are available on a number of other rivers as described in section 2.2.

Using this method, in the Fraser River, the four small disposal sites would be excluded from CEPA controls. In the Bras d'Or Lakes this method would include the Lakes, as they are brackish rather than freshwater and further evaluation of client, regulatory and environmental impact would need to occur. This method produced lines similar to those using the mouth of the river and could be considered but was thought to be less inclusive than the maximum salinity approach and less straight forward than the mouth of the river approach.

f) Provincial Lines

Few provincial lines, other than provincial fisheries lines derived from lines defined by DFO regulations, have been identified. These lines are specific to the province only and would not provide a nationally consistent method.

g) Interstitial salinity

Another suggestion for classifying areas as marine, estuarine or freshwater environments is to measure the salinity of water extracted from bottom sediments (interstitial water). The method has the benefit of minimizing fluctuations as a result of tides and short-term changes in river flow as sediment salinity changes much more slowly than conditions in the river. Lines set using such an approach would be more defensible in the Ocean Disposal Program based on the principle of protecting the benthic environment and habitat. Unfortunately there is minimal data readily available and data collection costs would be quite high.

Appendix B - Boundaries of the Sea Committee

This document is the result of work done by a committee looking at methods that might be used in setting boundary lines for the Ocean Disposal Program. Written comments should be submitted to the author at Environment Canada's National Capital office in Gatineau, Quebec. If you wish to discuss the issue further you may contact the author, the Chair, or the committee member in your region.

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