CANADIAN ICE SERVICE DIGITAL ARCHIVE – REGIONAL CHARTS:

CANADIAN ICE SERVICE ICE REGIME REGIONS (CISIRR) AND SUB-REGIONS WITH ASSOCIATED DATA QUALITY INDICES

CIS Archive Documentation Series No. 3

January 2019

PAGE LEFT INTENTIONALLY BLANK

Revision History

April 2006	• Original document.
September 2006	• Formatted fro CIS Digital Archive Series.
March 2007	• Addition of sub-regions cwa05_03 and cea12_03. • Modifications to cwa01_02, cwa01_03, cwa05_01, and cea12_02. • Text, graphics and tables modified accordingly.
December 2018	• URL links checked and annotated
January 2019	• References from the 2004 Bibliography CISADS no.4 added into this document

PAGE LEFT INTENTIONALLY BLANK

Acknowledgements

This document and the Ice Regime Regions could not have been completed without the input and advice from a number of individuals including: Bea Alt, Adrienne Tivy, Steve Howell, Tom Agnew, Tom Carrieres, Greg Crocker, Richard Chagnon, Bernard Miville, Sharon Jeffers, John Falkingham, Rick Power, Claude Dicaire, Katherine Wilson, Roger de Abreu, Humphrey Melling, Allain Cardinal, Gilles Langis and others not specifically mentioned

Special acknowledgement goes to Steve McCourt who put this document together and Bea Alt for her valuable contribution to the content of this document.

PAGE LEFT INTENTIONALLY BLANK

Executive Summary

This document is written with the intention of providing a set of standard regions and sub-regions that represent unique ice regimes.

A number of applications have been outlined and include:

- CIS area calculations (semi-real-time evaluations of ice conditions).
- Climate change monitoring.
- Model validation.
- Canadian Long-range Ice Forecast (CLIF) program research.
- Climate Change Action Fund (CCAF) Northwest Passage project baseline.
- Quality Assessment (time series homogeneity) of CIS Digital Archive.
- Identification of unique features of ice regime for short range forecast modeling.
- Comparison of ice conditions with other cryospheric and climate parameters.
- Background for process research.

Every identified region and sub-region is described in its entirety and includes the following information:

- Name.
- Points (including start and end points for enclosure of the boundary).
- Description (including named geographic entities).
- Discussion (including rationale for boundaries and references to previous schema).

A set of quality indices are presented to give an overall impression of the reliability of the sea ice information contained within each region and sub-region which are based upon information culled from a number of sources.

The exact geographic coordinates expressed in latitude and longitude for every enclosed area are presented in tabular format in Appendices 1 and 2.

PAGE LEFT INTENTIONALLY BLANK

Table of Contents

6.0 Tables

7.0 Appendices

PAGE LEFT INTENTIONALLY BLANK

1.0 Introduction

1.1 Purpose

To provide a set of standard regions and sub-regions that represent unique ice regimes.

1.2 Applications

- CIS area calculations (semi-real-time evaluations of ice conditions).
- Climate change monitoring.
- Model validation.
- Canadian Long-range Ice Forecast (CLIF) program research.
- Climate Change Action Fund (CCAF) Northwest Passage project baseline.
- Quality Assessment (time series homogeneity) of CIS Digital Archive.
- Identification of unique features of ice regime for short range forecast modeling.
- Comparison of ice conditions with other cryospheric and climate parameters.
- Background for process research.

1.3 Organisation of Report

Section 1 includes discussion of the general definition, naming conventions and boundary definition methods.

Section 2 includes detailed definitions for each Region ordered by Region Number (the Sub-regions being treated within the Region sections). Details include definition and supporting rationale for the boundaries,, locations including relationships to previous area schemes, and some general comments regarding problems and strengths of the data in the Region / Sub-regions including, if applicable, reasons for designation as “Test” regions.

Section 3 constructs Quality Indices for each Region and Sub-region and shows the relative data quality by Region / Sub-region and by time period.

Lists of figures and tables will follow Section 3.

Reference should also be made to two companion reports:

1. CISDA - Regional Charts: History, Accuracy, and Caveats
   English: http://www.ice-glaces.ec.gc.ca/IA_DOC/cisads_no_001_e.pdf
   French: http://www.ice-glaces.ec.gc.ca/IA_DOC/cisads_no_001_f.pdf
   French says coming soon
2. CISDA - Regional Charts: Working with the Gridded Data in NetCDF and Text Formats
   English: http://www.ice-glaces.ec.gc.ca/IA_DOC/cisads_no_002_e.pdf
   French: http://www.ice-glaces.ec.gc.ca/IA_DOC/cisads_no_002_f.pdf
   Both say coming soon

Additional reference should be made to the bibliography of reports and published papers using the CIS Digital Archive and other papers which contain ice regime classification schemes:

Bilingual: http://ice-glaces.ec.gc.ca/IA_DOC/cisda_biblio.pdf

1.4 Methodology

1.4.1 General Definition

The four Canadian Ice Service (CIS) Regional Sea Ice Chart boundaries are shown in Figure 1. The boundaries of these charts were adjusted in 1996. The "common boundary" defining the area which is common to the whole period is shown by the heavy line in Figure 1.

The **CIS Ice Regime Regions** (Figure 2) **and Sub-regions** (Figure 3) were defined in consultation with operational and research sea ice experts from Government, University, and Industry and from a review of the many existing schemes developed for research and operational needs. They represent areas for which time series can be constructed for more than 30 years. Some of the boundaries are dictated by the extent of the CIS Regional Ice Charts[1] over the 30+ years of record (Figure 1). In the following Region-by-Region discussions, reference will be made to previous area schemes.

The two regions (tew02 and tea10) have been defined as "Test" Ice Regime Regions (Figure 4) due to the lack of sufficient data consistency levels over the 30+ year period. "Test" Ice Regime Sub-regions (Figure 4) have been defined within both the CIS (e.g. cew03 and cea08) and "Test" (e.g. tew02 and tea10) Ice Regime Regions to meet the research needs of users (both internal and external to CIS). In some cases the "Test" Ice Regime Sub-regions are further sub-divisions of CIS Ice Regime Regions (e.g. tea08_11, tea08_12, and tea08_13). Although the "Test" regions and sub-regions can not be used for trend analysis, they can be used (particularly for the RADARSAT era, 1996-present) for specific research purposes if careful attention is paid to the known (and potentially undiscovered) inconsistencies in the data series. In addition to the "Test" sub-regions, "Choke Point Areas" have been defined for Hudson Bay and Hudson Strait (Figure 5) and "Critical Areas" have been defined within the Gulf Region (Figure 6). These were mainly for long-range forecasting research but might be used with caution for climate monitoring.

1.4.2 Naming Conventions

The short names are designed as file names or abbreviations (Tables 1 and 2). The first word or letter designates whether the Region is a standard CIS Ice Regime Region / Sub-region or a user defined "Test" Ice Regime Region / Sub-region. The second set of letters refer to the four CIS operational "Regional" sea ice charts, (EA = Eastern Arctic, WA = Western Arctic, HB = Hudson Bay, EC = East Coast and EW = a combination of the Eastern and Western Arctic). It defines the Regional Chart(s) files that are used in the area calculations for the Region / Sub-region from the digital archive. The first two numbers in the short name are the Region number and the numbers after the underscore character ("_") are the Sub-region number. The CIS Sub-regions are numbered from 01 to 09 and the "Test" Sub-regions are numbered from 11 to 99. The Regions (CIS and "Test") all have "00" after the underscore character ("_"). The region names use "western", "eastern" etc., and include the "bay", "channel", etc. (e.g. "Western Parry Channel"). The Sub-regions abbreviate directions and omit the "bay", "channel", etc. where necessary to keep the name short (e.g. "Lancaster - E Barrow").

[1] One of the main uses of the CISIRRs is for area calculations derived from the digital archive. Each Ice Regime Region or Sub-region is currently stored as a shape record in a shapefile and is used to clip areas directly from individual charts. Regional Ice Charts are currently stored as Arc/Info export files (e00) although the future promises integration into a centralized spatial database.

The Regions, and where possible, the Sub-regions are numbered from west to east and north to south.

1.4.3 Defining Boundaries

Wherever possible, named geographical features (KNOWN_DMS)[2] which appear in the Canadian Geographical Names Database (CGNDB) available on the web at http://geonames.nrcan.gc.ca/were used in the boundary definitions to allow more accurate definition of the boundaries in non-GIS environments (such as gridded databases). Where a named geographical location did not exist, either a prominent unnamed feature such as a point of land or the intersection of the coastline with a line of latitude or longitude was used.

Straight lines have been used to define the boundaries even in areas of known ice-arches such as the north end of the North Open Water (NOW) polynya due to the need to be able to define the region for all types of media and users[3].

The boundaries for each Region and Sub-region are available as GIS shapefiles (McCourt 2005) and the points and their latitudes and longitudes (in decimal degrees) are shown in Tables 1 and 2.

There are several types of points in the boundaries. The following text describes all the types of points that compose a Region or Sub-region using the example Region cwa01_00 and its underlying Sub-regions. The black circles in Figure 7 and black records in Table 3 refer to the named and unnamed points used to define the Region / Sub-region. The red lines in Figure 7 and red records in Table 3 refer to the minimum extent of the Regional Chart boundaries through the period of record (these appear as “common chart boundary” in the PNT_NAME column in Table 3). The purple circles in Figure 7 and purple text in Table 3 refer to points which have been created in order to maintain a closed polygon, which is mandatory for use in a GIS, and generally fall over top of land. The blue points and lines in Figure 7 and blue records in Table 3 refer to points which have been created in order to approximate any curvature of lines of latitude or longitude due to the projecting of the map coordinates.

The points for the closed polygon for each region are numbered consecutively (POINT_ID column in Table 3 and numbered labels in Figure 7). The first point is repeated at the end to make a closed polygon resulting in the point having two different POINT_ID values (e.g. POINT_IDs 10 and 400 for Region 01_00 in Table 3). The points for the following region begin with the next number. Thus the points for the polygon for Region ew02_00 begin at 410. The points for the Sub-regions begin at 6050 (following the last Region point POINT_ID of 6040). Where regions share a boundary, there will also be points with more than one POINT_ID number. For example, points 40 to190 of Region cwa01_00 and points 690 to 840 of Region tew02_00 are the same point. Where the Sub-regions within a Region share a boundary with the parent Region, these points will also have at least two POINT_ID values. For example, points 140 to 220 of Region cwa01_00 and points 6650 to 6730 (also coincident POINT_ID 6590 (see discussion below)) of Sub-region cwa01_04 are the same points (green points in Figure 8 and green records in Table 4)[4]. Multiple

---

[2] Degree, Minute, Second format was used to report latitude and longitude positions.

[3] Defining ice arches is not as easy for gridded data sets and operations as it is in GIS operations. A file could be prepared defining the grid for a 0.25 deg grid (e.g. NetCDF) but if the modellers decide to adopt a finer scale and we need to produce a finer gridded dataset it will become unnecessarily complicated. Although it is recognised that straight lines are unrealistic according to ice dynamics, it is deemed appropriate in order to facilitate all levels of user and a wise decision in the long run.

[4] These points are also common with tew02_00 and tew02_01.

POINT_ID numbers are possible for an individual point (see point 6590 in Figure 8). For example if a point happens to be at the joining of three regions, each having sub-regions, there would be six different POINT_ID numbers. Furthermore, if any of these points were the first point in the loop then more than six different POINT_ID numbers would result. In the examples shown in Figures 7, 8, and 9 and Tables 3 and 4, there are 7 occurrences of Cape Prince Alfred (see also Appendices 1 and 2).

Applying these boundaries to non-GIS environments such as gridded datasets would involve identifying those grid points that fall within each polygon. Miville used a mask containing the Canadian Long-range Ice Forecasting (CLIF) region (sub-region) number for each grid point to calculate area averages from gridded data. A similar file will be necessary for working with the 0.25 degree merged gridded netCDF version of the archive.

1.4.4 Conventions and Abbreviations Used in the Region by Region Discussion

In the following Region-by-Region discussions, reference will be made to previous area schemes by author / date (e.g. "Jeffers et al. (2001)" or "Melling (2002)"). In addition, references to the climatological positions of various ice conditions as shown in the CIS *East Coast of Canada* (CIS 2001) and *Northern Canadian Waters* (CIS 2002) Atlases are given by atlas reference and figure / page number (e.g. CIS 2002, A10). The point number(s) in Tables 1 and 2, and Appendices 1 and 2 are provided for each Region / Sub-region. References to the initial Region and Sub-region scheme developed under the CLIF program, which combines the expertise of operational ice forecasters and research scientists, will be designated as "CLIF" in the following (see Alt and Tivy 2002 for discussion).

2.0 Region and Sub-region Definitions

In the following Region and Sub-region definitions, reference should be made to the detailed point listings in Tables 1 and 2, and Appendices 1 and 2, and to the maps in Figures 2 through 4. Reference to other figures or tables will be provided when necessary.

2.1 CIS WA Beaufort Sea

Short name: cwa01_00

Points: 10 - 400

Description: The western boundary of Region 01_00 runs along the common chart boundary to the line of latitude 76 N (Figures 1 and 7 and Table 1). It runs along the line of latitude 76 N until it hits the coast of Prince Patrick Island (Figure 7) and then leaves Prince Patrick Island from the unnamed point north of Perseverance Point to avoid crossing the small islands south of Prince Patrick Island. It crosses to Cape Prince Alfred on Banks Island thus defining the western edge of M'Clure Strait (Western Parry Sound Region) by a straight line joining these two points. It leaves southern Banks Island from Cape Kellett crossing to Cape Bathurst on the mainland. This line defines the western boundary of Amundsen Gulf (Western Arctic Waterway).

Sub-regions were defined within the Beaufort Sea area to capture the extent of old ice from the Arctic Ocean in various seasons:

cwa01_01	CIS WA Beaufort Sea: Alaska
cwa01_02	CIS WA Beaufort Sea: Mackenzie
cwa01_03	CIS WA Beaufort Sea: Banks
cwa01_04	CIS WA Beaufort Sea: Prince Alfred
cwa01_05	CIS WA Beaufort Sea: Canada Basin

Discussion: Much of the boundary is defined by the common chart boundary (Figures 1 and 7 and Table 1). The common boundary leaves the Alaskan coast at the western extent of the 1997-present chart boundary and the V shaped dip is determined by the extent of the pre-1997 charts. The line of latitude 76 N was chosen as the simplest boundary between the Beaufort and Arctic Ocean Periphery Regions. This is indicated by the boundary for the Western Arctic Area defined by Falkingham et al. (2001). Similarly the definition of the western edge of M'Clure Strait (Western Parry Sound Region) as the straight line from southwestern Prince Patrick Island to northwestern Banks Island provides the most straightforward boundary and is supported by Ballicater (2000), CLIF (2002), CIS (2002), Melling (2001). Jeffers et al. (2001) used a curved line in a similar location. The western boundary of Amundsen Gulf (Western Arctic Waterway) is also defined as the straight line from Banks Island to the nearest point of land on the mainland. This is the simplest boundary and is supported by CIS (2002) and Ballicater (2000)[5].

There has always been seasonal shipping along the coast so the Alaska and Mackenzie Sub-region summer open water extents are generally well represented over the full 30 year record. The Banks open water area may also be reasonably reliable over most of the record. north of this, however, there was very little information available in real time to the Regional Charts in the early years and although ice conditions change reasonably slowly

[5] However, both Crocker (2000b) and AIRSS Zones place it further east suggesting the Beaufort Sea conditions extend east into Amundsen Gulf. This eastern position can be supported by spring ice conditions (Arctic A6-A14). In the present Region definition scheme the choice was to place this area in the Amundsen Sub-region of the Western Arctic Waterway Region.

in this region, trend analysis should be treated with caution. There are additional sources (CIS Historical charts, Polar Continental Shelf Project (PCSP) charts and U.S. National Ice Center (NIC) charts) which might be used to refine the early years.

2.1.1 CIS WA Beaufort Sea: Alaska

Short name: cwa01_01

Points: 6120 - 6250

Description: The Region boundary forms the western and northwestern boundary of the Alaska Sub-region. The eastern boundary is defined by the U.S. - Canada border. The northeastern boundary separating the Alaska Sub-region from the Canada Basin Sub-region follows latitude 72 N (with the exception of a small jog where it joins the common chart boundary).

Discussion**:** The U.S. - Canada border is used as a convenient division between the area north of Alaska where the ice remains through late August and the Mackenzie Sub-region which opens as early as July (CIS 2002, A14-21). The northeastern boundary along latitude 72 N not only represents the median southerly extent of less than 9/10 coverage at the time of maximum open water (CIS 2002, A22-26) but also the median extent of predominantly old ice (CIS 2002, A35 and A183). It was used by Falkingham et al. (2001) as the northern boundary of the “Western Arctic” study area (see also southern extent of “area 1” in Melling 2001 and the northern boundary of AIRSS Zone 4).

2.1.2 CIS WA Beaufort Sea: Mackenzie

Short name**:** cwa01_02

Points: 6260 - 6460

Description: The U.S. - Canada border (longitude 141 W) separates it from the Alaska Sub-region. It is separated from the Prince Alfred Sub-region to the north by latitude 72 N and separated from the Banks Sub-region by a line extending from Cape Bathurst, through Baillie Island and continuing northwest to latitude 72 N.

Discussion: This Sub-region, which represents the area north of the Mackenzie River, is well defined on the median ice coverage charts from July to September (CIS 2002, A12-23) as being distinct from the Alaska Sub-region to the west (U.S. - Canada border (longitude 141 W)) and from the Canada Basin and Prince Alfred Sub-regions to the north. It represents the area which is normally open water in the summer and first-year ice in the winter.

2.1.3 CIS WA Beaufort Sea: Banks

Short name: cwa01_03

Points**:** 6470 - 6570

Description: The Region boundary forms the eastern edge of the Sub-region (see inset in Figure 7 for details) and the southwestern boundary is defined by a line extending from Cape Bathurst, through Baillie Island and continuing northwest to latitude 72 N. The boundary then extends northeast to Cape Prince Alfred (Figure 7).

Discussion: The sub-region expands upon the latitude 72 N definition of the southern boundary used by Melling (2001) and is supported by the median concentration charts (CIS 2002, A18-21) and the median old ice charts (CIS 2002, A118-119). The sub-region represents the extent of the open water area which opens along the west coast of Banks Island in more than half the years (CIS 2002, A84). For this reason, the western boundary extends northeast to Cape Prince Alfred on Banks Island rather than to southern Prince Patrick Island as in the classification used by Melling (2001). Ice conditions in this sub-region are often similar to those in the Mackenzie Sub-region, however, they can be significantly different in years where ice is pushed up against the coast of Banks Island.

This sub-region was altered from its initial definition in order to accommodate recent findings suggesting increases in the concentration of old ice to the west and south of the original sub-region. Ideally the area could be extended by 2 degrees to the west to capture the relevant information. However, in order to limit the number of changes to the surrounding sub-regions it was deemed a reasonable compromise to maintain the existing shared boundary with the Prince Alfred Sub-region.

2.1.4 CIS WA Beaufort Sea: Prince Alfred

Short name: cwa01_04

Points: 6580 - 6720

Description: The boundary to this Sub-region (Figure 8 and Table 4) runs from Cape Prince Alfred to longitude 131 W along latitude 72 N and then along latitude 72 N to longitude 135 W and northeast to the intersection of latitude 76 N and longitude 127 W. From there it runs along latitude 76 N to Prince Patrick Island where it joins the Region boundary for the return to Cape Prince Alfred.

Discussion: The Sub-region represents the transition from the normally open water area (at the height of summer) to the Polar Pack. It has variable amounts of ice and particularly old ice depending upon the wind and temperature conditions (CIS 2002, A135-140 and A155).

2.1.5 CIS WA Beaufort Sea: Canada Basin

Short name: cwa01_05
Points: 6730 - 6970

Description: The boundary for this Sub-region corresponds to the Region boundary in the north and west and runs along latitude 72 N in the south and then northeast from longitude 135 W to the junction of latitude 76 N and longitude 127 W.

Discussion: This Sub-region is designed to isolate the normal extent of predominantly old ice (CIS 2002, A163-193) and more than 9/10 ice coverage (CIS 2002, A20-24). The southern boundary of this Sub-region is similar to both the northern boundary used for the “Western Arctic” study area defined by Falkingham et.al. (2001) and to the northern boundary used for the AIRSS zone map. Both these classifications remove the polar pack area from the study of ice conditions in the Beaufort Sea area.

2.2 TEST EA-WA Arctic Ocean Periphery

Short name: tew02_00

Points: 410 - 840

Description: The northern boundary runs from the northwest corner of the Beaufort Sea Region at latitude 76 N and longitude 127 W along the common chart edge to where it hits northern Axel Heiberg Island (south of Cape Thomas Hardy). The southern boundary runs from Cape Northwest on Axel Heiberg Island to the unnamed northeast corner of Meighen Island and leaves Meighen Island where longitude 100 W hits southwestern Meighen. The boundary crosses Peary Channel to the point where the early Eastern Arctic chart line hits Ellef Ringnes Island. It leaves the southwest corner of Isachsen Peninsula (Ellef Ringnes Island) crossing Gustaf Adolf Sea to the point where the line of longitude 110 W hits Borden Island. It leaves southwestern Borden Island where longitude 113 W hits the coast and crosses to where latitude 78 N meets eastern Brock Island. From the western coast of Brock Island at 77° 55' N the boundary cuts across the northern Ballantyne Strait to Cape Krabbe on Prince Patrick Island. The southern boundary is completed in the west by the northern boundary of the Beaufort Sea Region running from southern Prince Patrick Island along the line of latitude 76 N.

The Region is divided into east and west "Test" Sub-regions because it extends across both the Western and Eastern Arctic Regional Charts by the line defining the western edge of the 1997- present Eastern Arctic chart (from the north end of Ellef Ringnes Island):

tea02_12	TEST EA Arctic Ocean Periphery: East
twa02_13	TEST WA Arctic Ocean Periphery: West

In the future attempts will be made to define more meaningful Sub-regions to isolate the lead area from the Polar Pack.

Discussion: The northern boundary of this "Test" Region is limited by the early charts particularly the Eastern Arctic chart area (Figure 1) which did not include any areas north of Ellesmere Island. It eliminates the northern parts of Nansen Sound and Nares Strait.

The southern boundary of this Region has been chosen to include the lead which often opens along the northwest edge of the land-fast inter-island ice. By including the lead in the Arctic Ocean Periphery Region, it thus excludes the lead (and resulting first-year ice) from the inter-island channel Regions and Sub-regions. The shape of this southern boundary is indicated on the end-of-August / beginning-of-September atlas charts (CIS 2002, A148-149 and A144-115) but was not used by Jeffers et al. (2001) or Melling (2002) who both joined the northern-most points of land creating inter-island areas which included some, but not all, of the lead area. For instance, the lead often continues south along western Meighen Island (e.g. CIS Winter Atlas 2000). The southern extent of the lead along the whole northwest edge of the inter-island ice can be seen on the CIS winter RADARSAT atlases for February 2000 and 2001 and on the PCSP charts (Lindsay, 1977, 1971, 1985) and to some extent on the CIS Historical charts.

This Region is defined as a "Test" Region and is not to be used for 30-year trend analysis because there are consistency problems within the early years and between the early years and the present.

In the early years there was little information for most of the season. The lead was visible on early satellite photos but these were not received in real time. In the early years, the The Regional Charts frequently recorded the Arctic Ocean ice as "9- 10/10 mostly old ice" and this was coded various ways during the digitization process. In some cases detailed information was available from a flight indicating less ice than these standard values but the flights were an irregular occurrence and might produce biased time series results. In addition, two further factors need to be considered:

1. Most of the observations were from flights which normally stayed within sight of the shear zone between the inter-island ice and the polar pack but these observations were applied to the whole Arctic Ocean area on the Regional Charts.

2. The flights would normally be undertaken in times of good weather (i.e. no cloud) which usually suggests a southerly component to the wind and thus increased open water along the northwest of the polar pack as it pulls away from the northwest edge of the QEI. Thus there may also be a temporal bias in the observations (i.e. the observations are taken in times of reduced ice concentration).

Currently the lead is clearly visible on RADARSAT imagery, however, the Arctic Ocean Periphery Region is still not a high priority area due to the lack of shipping activity. There is a tendency to use a standard value for the conditions over the whole area. An investigation of the values used on charts in the RADARSAT years (1996-2001) showed the following: The basic winter value is a total concentration of “9+/10”, consisting of a single ice type “7.” in floes of “6”. In all years the summer is represented by a total concentration of “9+/10” consisting of “9/10” ice type “7.” in floes of “6” and “1/10” ice type “4.” in floes of “6” but in some years this value extends into winter as well (3 out of the 7 years examined). In most years the October – December charts show a total concentration of “9+/10” consisting of “9/10” ice type “9.” in floes of “6” and “1/10” ice type “8.” in floes of “6” (the change from “4.” to “8.” indicates the October 1st birthday of ice where first-year ice becomes second-year ice). Although these values may adequately represent the broad scale conditions for the region the differences between these conventions and the sometimes detailed or sometimes non-existent observations of the early years will not produce reliable 30-year time series.

2.2.1 TEST EA Arctic Ocean Periphery: East

Short name: tea02_12

Points: 6980 - 7070

Description: This Sub-region exists solely because of the boundary between the Eastern and Western Arctic Regional Charts. Due to the artificial nature of this “Test” Sub-region, refer to the Region description above.

Discussion: See Region discussion above.

2.2.2 TEST WA Arctic Ocean Periphery: West

Short name: tea02_13
Points: 7080 - 7460

Description: This Sub-region exists solely because of the boundary between the Eastern and Western Arctic Regional Charts. Due to the artificial nature of this "Test" Sub-region, refer to the Region description above.

Discussion: See Region discussion above.

2.3 CIS EA-WA Western High Arctic

Short name: cew03_00

Points: 850 - 1490

Description: This Region uses "EW" in its name to indicate that it spans both the Eastern and Western Regional Charts (Figures 1 and 3). Sub-regions within this Region will use either "EA" or "WA" in their names to indicate which Regional Chart they are associated with.

The northern boundary runs from Cape Northwest on Axel Heiberg Island to the unnamed northeast corner of Meighen Island and leaves Meighen Island where longitude 100 W hits southwestern Meighen Island. It crosses Peary Channel to the point where the early Eastern Arctic chart line hits Ellef Ringnes Island. It leaves the southwest corner of Isachsen Peninsula (Ellef Ringnes Island) crossing Gustaf Adolf Sea to the point where longitude 110 W hits Borden Island. It leaves the southwestern coast of Borden Island at longitude 113 W and crosses to where latitude 78 N meets eastern Brock Island. From the western coast of Brock Island at 77° 55' N the boundary cuts across the northern Ballantyne Strait to Cape Krabbe on Prince Patrick Island. The eastern boundary runs across the west end of Hendriksen Strait in a straight line from the southwest tip of Amund Ringnes to the northwest corner of Cornwall Island and then across the western end of Belcher Channel from the southwestern corner of Cornwall Island to the point of Grinnell Peninsula (Devon Island) southeast of Crescent Island.

The southern boundary has been chosen as the simplest line across the southern end of Crozier and Kellett Straits. It runs from Cape Cam on Prince Patrick Island to Cape Nares on Eglinton Island and from Pedder Point on Eglinton Island to Cape Russell on Melville Island. The boundary has been drawn straight across the southern end of Byam Martin and Austin Channels using the line of latitude 75 N and ending at Cape Cockburn on Bathurst Island. The line of latitude 75 N is also used across the southern end of McDougall Sound.

The Region has been sub-divided into ten "Test" Sub-regions[6] due to the need to examine detailed ice conditions for research such as the Peary-Sverdrup ice import study (Alt et al. 2006) which concentrate on recent years (RADARSAT era) and do not use the data for trend analysis but rather for case studies of specific years and situations:

[6] For the area calculations both the Western and Eastern Regional Charts need to be used. Because of this at least two functional sub-regions would have been necessary – divided by a line common to both the early and present charts.

twa03_11	TEST WA Western High Arctic: Kellett - Crozier
twa03_12	TEST WA Western High Arctic: Ballantyne - Hazen
twa03_13	TEST WA Western High Arctic: Gustaf Adolf
twa03_14	TEST WA Western High Arctic: Byam Martin
twa03_15	TEST WA Western High Arctic: KCI West
tea03_16	TEST EA Western High Arctic: Peary - Sverdrup
tea03_17	TEST EA Western High Arctic: KCI East
twa03_18	TEST WA Western High Arctic: McDougall
tea03_19	TEST EA Western High Arctic: Penny
tea03_20	TEST EA Western High Arctic: Wellington

Discussion: The northern boundary of this Region has been chosen to exclude the lead which often opens along the northwest edge of the land-fast inter-island ice. By including the lead in the Arctic Ocean Periphery Region, it thus excludes the lead (and resulting first-year ice) from the inter-island channel Regions and Sub-regions. The shape of this northern boundary is indicated on the end-of-August / beginning-of-September atlas charts (CIS 2002, A148-149 and A144-115) but was not used by Jeffers et al. (2001) or Melling (2002) who both joined the northern-most points of land creating inter-island areas which included some, but not all, of the lead area. For instance, the lead often continues south along western Meighen Island (e.g. CIS Winter Atlas 2000). The southern extent of the lead along the whole northwest edge of the inter-island ice can be seen on the CIS winter RADARSAT atlases for February 2000 and 2001 and on the PCSP charts (Lindsay, 1977, 1971, 1985) and to some extent on the CIS Historical charts.

The eastern boundary crossing Hendriksen Strait and Belcher Channel is similar to that used by Melling (2002), Jeffers et al. (2001), and CLIF.

The ice regime and previous classifications schemes suggest several possible positions for the southern boundary separating the QEI inter-island area from M'Clure Strait and Viscount Melville Sound. Some of these (Melling 2002, CLIF, and Falkingham et al. 2001) include most of Crozier and Kellett Straits in the Parry Channel region due to the extent of the summer break-up as seen in the median ice concentration charts (CIS 2002, A18-21). The extent of the penetration of break-up into the straits varies considerably from year to year and from season to season. In addition, shipping routes through western Parry Channel would not be diverted into these straits. Thus the boundary of the Western Parry Channel region has been chosen as the simplest line across the southern end of these straits. Similarly, the summer break-up extends into Byam Martin and Austin Channels (CIS 2002, A18-21) as reflected in the boundaries used in CLIF, Jeffers et al. (2001), and Falkingham et al. (2001). However, to isolate Viscount Melville Sound from the inter-island area, the boundary has been drawn across the southern end of these channels using the line of latitude 75 N ending at Cape Cockburn on Bathurst Island (similar to Ballicater 2000). By the same argument, the line of latitude 75 N is also used across the southern end of McDougall Sound.

The southern boundary continues in a line from Cape Dungeness on Cornwallis Island to the unnamed point on the southwest corner of Devon Island. This boundary is similar to Jeffers et al. (2001) but it is south of the position used by Crocker (2002). The median ice concentration charts support both the southern position (CIS 2002, A4 and A15) and the northern position (CIS 2002, A34 and A16-17). The southern position has been chosen as the simplest option and the boundary defined as the straight line from point to point at the mouth of the Channel.

2.3.1 TEST WA Western High Arctic: Kellett – Crozier

Short name: twa03_11

Points: 7470 - 7600

Description: The southern boundary coincides with the Region (straight across the southern end of Crozier and Kellett Straits). The northern boundary runs across the top of Fitzwilliam Strait from Cape Hemphill on northeastern Prince Patrick Island to the unnamed southwest tip of Emerald Island and then to the point on the north end of Sproule Peninsula on Melville Island.

Discussion: The reasons for the southern boundary can be found in the Region discussion above. There are several possibilities for the northern boundary but the simplest has been chosen here. The position across the northern end of Fitzwilliam Strait is reflected by the edge of median old ice concentration in some months (CIS 2002, A112-114 and A123) although not in others (CIS 2002, A115-121).

2.3.2 TEST WA Western High Arctic: Ballantyne – Hazen

Short name: twa03_12

Points: 7610 - 7820

Description: The western boundary, across the top of Fitzwilliam Strait is defined above in the Kellet – Crozier Sub-region and the northern boundary is shared with the Region. The eastern boundary runs across the eastern end of Wilkins Strait from the unnamed southeast corner of Borden Island to the Northeast corner of Mackenzie King Island and then across the eastern end of Hazen Strait from the southeast corner of Mackenzie King Island to Cape George Richards on Melville Island.

Discussion: This boundary isolates the area of inter-island ice which is protected from the intrusion of Arctic Ocean by Brock and Borden Islands and which often remains land-fast longer than Gustaf Adolf Sea to the east (CIS 2002, A26). The amount of ice, particularly of old ice, is overestimated in this area in the early years.

2.3.3 TEST WA Western High Arctic: Gustaf Adolf

Short name: twa03_13

Points: 7830 - 8030

Description: The northern boundary is shared with the Region as defined above. The western boundary is defined above in the Ballantyne – Hazen sub-region. The eastern boundary runs from where longitude 104 W hits Noice Peninsula on Ellesmere Island to where longitude 106 W hits the northern corner of Lougheed Island and then from where longitude 105 W hits southern Lougheed Island. From there it crosses Desbarats Strait to the unnamed northwest corner of Cameron Island and across Cameron Island to Vanier Island along the line of longitude 104 W. The southern boundary across the outlet to Byam Martin Channel runs from the west tip of Vanier Island to where the latitude 76 N hits the western coast of Melville Island.

Discussion: The eastern boundary eliminates from the Sub-region the Maclean Strait area between King Christian Island (KCI), Lougheed Island, and Ellef Ringnes Island which breaks-up from the south in many summers. It confines the Sub-region to the area which either remains land-fast all season or fractures, allowing inter-island and also Arctic Ocean ice to stream southward into Byam Martin Channel (CIS 2002, A104-105). The southern boundary is the straight line representing the arch that often forms across northern Byam Martin Channel in late fall (CIS 2002, A105-117). In the early years the concentrations, particularly the old ice concentrations, are overestimated due to a lack of information available to the Regional Charts.

2.3.4 TEST WA Western High Arctic: Byam Martin

Short name: twa03_14

Points: 8040 - 8240

Description: The northern boundary as discussed above is the straight line from western Vanier Island to where latitude 76 N hits the west coast of Melville Island. The eastern boundary runs through Massey Island to Alexander Island along longitude 103 W and then from Alexander Island to Bathurst Island at the western end of the strait that separates them (just north of Peel Inlet). The southern boundary was chosen to be the line of latitude 75 N which runs from the southeast corner of Melville Island, just missing the southern coast of Byam Martin Island, to the southwest corner of Bathurst Island.

Discussion: The southern boundary represents the simplest definition of the southern end of Byam Martin and Austin Channels. It is seen briefly in the median concentration charts (CIS 2002, A18-19) at the beginning of break-up in mid August. The area is presently not of shipping interest but in the 1970s Rae Point was occupied by petroleum exploration ventures.

2.3.5 TEST WA Western High Arctic: KCI West

Short name: twa03_15

Points: 8250 - 8480

Description: The western boundary is defined in the Gustaf Adolf Sub-region above. The eastern boundary runs along the common chart boundary (Figure 1) from the southern coast of Ellef Ringnes Island to the northern coast of Bathurst Island. This boundary cuts through eastern King Christian Island (KCI).

Discussion: The location of the eastern boundary and to some extent the existence of the Sub-region is a result of the limited extent of the early Western Arctic Regional Chart (Figures 1 and 3). The common chart boundary cuts through the area surrounding King Christian Island (KCI) which breaks-up in most summers. The extent of this area of break-up and the reduced old ice resulting from it varies from season to season and was poorly monitored in the early years. However, it is a persistent feature of the inter-island ice regime (CIS 2002, A115-120 and A162).

2.3.6 TEST EA Western High Arctic: Peary – Sverdrup

Short name: tea03_16

Points: 8490 - 8660

Description: The northern boundary is shared with the Region. The southern boundary crosses southern Hassel Sound between Ellef Ringnes and Amund Ringnes Islands along latitude 78 N and continues through southern Massey Sound from Cape Ludwig on Amund Ringnes Island to Cape Southwest on Ellesmere Island.

Discussion: The northern boundary as discussed above was chosen to exclude the lead which often opens along the northwest edge of the land-fast inter-island ice. It leaves Meighen Island well south of the northern tip because the lead often turns south along western Meighen (e.g. CIS Winter Atlas 2000). The simplest boundary was chosen for southern Massey Sound between named points on Ellesmere and Amund Ringnes Islands. It is similar to Jeffers et al. (2001) and Melling (2002). In terms of ice conditions it is a compromise between the median position of the 10/10 old ice edge and the 9 to 9+/10 old ice median position at the height of the summer season. The boundary across southern Hassel Sound is similar to Jeffers et al. (2001) and supported by the median ice concentration pattern (CIS 2002, A18-21) but is further north than Melling (2002).

In addition to the problem of overestimating concentrations and old ice coverage in the early years, there is another problem, particularly in northern Sverdrup Channel (Sverdrup Plug area), resulting from the tendency on the Regional Charts to show the whole area as broken when portions of it were still land-fast.

2.3.7 TEST EA Western High Arctic: KCI East

Short name: tea03_17

Points: 8670 - 8880

Description: The western boundary is the common chart boundary from Ellef Ringnes Island to northern Bathurst Island. The northern boundary runs across Hassel Sound as defined above in the Peary-Sverdrup Sub-region. The eastern boundary runs across the west end of Hendriksen Strait in a straight line from the southwest tip of Amund Ringnes Island to the northwest corner of Cornwall Island and then across the western end of Belcher Channel from the southwest corner of Cornwall Island to the coast of Grinnell Peninsula (Devon Island) to the southeast of Crescent Island. The southern boundary across the entrance to Penny Strait runs from the coast of Grinnell Peninsula (Devon Island) to the northeast corner of the hook-shaped point on northeastern Bathurst Island.

Discussion: This is the other eastern half of the area where the ice breaks up around King Christian Island (KCI) and is separated from KCI West by the common chart boundary. The northern boundary runs across Hassel Sound as defined above in the Peary-Sverdrup Sub-region. The eastern boundary, a straight line across the west end of Hendriksen Strait is similar to Melling (2002), Jeffers et al. (2001), and CLIF. It also crosses the western end of Belcher Channel as in Melling (2002), Jeffers et al. (2001), and CLIF. The southern boundary across the entrance to Penny Strait is similar to Jeffers et al. (2001), Melling (2002), and CLIF. Although this Sub-region and its western counterpart exist primarily because of the location of the division between the Eastern and Western Regional Charts in the early years, it does in fact isolate the through-flow of ice from Peary-Sverdrup into Penny Strait (Alt and Wilson submitted).

2.3.8 TEST WA Western High Arctic: McDougall

Short name: twa03_18

Points: 8890 - 9090

Description: The northern boundary extends from the eastern coast of the unnamed peninsula on southeastern Bathurst Island to the western coast of Little Cornwallis Island and then along longitude 96 W from the southeastern coast of Little Cornwallis Island to western Cornwallis Island. It continues over land to join Cape Rosse. The southern boundary, which is the Region boundary, runs along the line of latitude 75 N from Cornwallis Island to Bathurst Island.

Discussion: This Sub-region is also a result of the early chart edge position. It accounts for a small area of the Western Arctic Regional Chart that would be part of the Penny Strait Sub-region if it was available on the Eastern Arctic chart. It is, however, a distinct regime with well defined boundaries due to the chain of Islands which mark its northern end. The southern boundary extends the boundary of the line of latitude 75 N used to define the northern extent of Viscount Melville Sound (see discussion of the Region above) to southwestern Cornwallis Island where it continues over land to join Cape Rosse to make the connection with Regions 04 and 09 (Figure 10).

The area has been well surveyed throughout the years due to activity at Resolute and the mine at Little Cornwallis Island but the Sub-region is very small.

2.3.9 TEST EA Western High Arctic: Penny

Short name: tea03_19

Points: 9100 - 9280

Description: The eastern boundary runs along the line of longitude 95 W from the southern coast of Grinnell Peninsula (Devon Island) to the northern coast of Cornwallis Island and then along the line of longitude 96 W from western Cornwallis Island to Little Cornwallis Island and then from the western coast of Little Cornwallis Island to the eastern coast of the unnamed peninsula on southeastern Bathurst Island. The northern boundary runs from the northeastern corner of the point on northeastern Bathurst Island to the unnamed point on Grinnell Peninsula (Devon Island).

Discussion: The boundaries are straight forward and delimit the area of break-up which occurs in the early spring which spreads out from several smaller polynyas (CIS 2002, A9-17). The polynyas show up well even on very early satellite photos but would likely be seen a week late on the Regional Charts as the satellite photos were not available in real time. This Sub-region would have been well surveyed in the early years by flights leaving Resolute for the west.

2.3.10 TEST EA Western High Arctic: Wellington

Short name: tea03_20

Points: 9290 - 9420

Description: The western boundary, as defined in the Penny Sub-region above, runs along longitude 95 W from Grinnell Peninsula (Devon Island) to Cornwallis Island through Dundas Island. The Region boundary forms the southern edge of this Sub-region, extending from Cape Dungeness on Cornwallis Island to the unnamed point on the southwest corner of Devon Island.

Discussion: The southern boundary (from Cape Dungeness to the unnamed point on the southwest corner of Devon Island) is similar to Jeffers et al. (2001) but it is south of the position used by Crocker (2002). The median ice concentration charts support both the southern position (CIS 2002, A4 and A15) and the northern position (CIS 2002, A34 and A16-17). The ice regime of this Sub-region is distinct from the Penny Sub-region but the position of the southern boundary is variable depending on the time of year. The southern position has been chosen as the simplest option and the boundary defined as the straight line from point to point at the mouth of the channel. Due to its proximity to Resolute the Sub-region has been reasonably well surveyed at least during the shipping season.

2.4 CIS WA Western Parry Channel

Short name: cwa04_00

Points: 1500 - 1990

Description: The western boundary of the Region defines the western edge of M'Clure Strait by a straight line joining Cape Prince Alfred on Banks Island to the unnamed point north of Perseverance Point on Prince Patrick Island. The northern boundary of the Western Parry Region has been chosen as the simplest line across the southern end of the straits that enter it from the north. It runs from Cape Cam on Prince Patrick Island to Cape Nares on Eglinton Island and from Pedder Point on Eglinton Island to Cape Russell on Melville Island. The boundary continues across the southern end of Byam Channel and Austin Channel using latitude 75 and ending at Cape Cockburn on Bathurst Island (similar to Ballicater 2000). The latitude 75 N line is also used to define the southern end of McDougall Sound.

The eastern boundary is constrained by the extent of the Western Arctic Regional Chart (Figure 1). It runs from Cape Rosse on Cornwallis Island to Pressure Point on Somerset Island.

The southern boundary runs west from Pressure Point on Somerset Island to Lyons Point on Prince of Wales Island where it leaves Prince of Wales Island from Cape Eden hitting northeastern Stefanson Island where longitude 105 W hits the coast. The boundary leaves western Stefanson Island from the intersection of longitude 107 W and the coast and continues along longitude 107 W to the coast of Storkerson Peninsula on Victoria Island. The boundary continues from Hay Point on Victoria Island across Prince of Wales Strait to the unnamed point opposite on Banks Island.
The Region has been sub-divided based on the distinctive ice regimes of western Barrow Strait, Viscount Melville Sound, and M'Clure Strait. A further "Test" Sub-region is suggested to account for the area which usually opens up south of Bathurst and Melville Island. Parry was the first to document this area and thus it has been dubbed "Parry Strip". The Region is divided into 3 Sub-Regions:

cwa04_01	CIS WA Western Parry Channel: M'Clure
cwa04_02	CIS WA Western Parry Channel: Viscount Melville
cwa04_03	CIS WA Western Parry Channel: W Barrow

Discussion: The western boundary defining the edge of M'Clure Strait is similar to Ballicater (2000), CLIF, and Melling (2001) and somewhat west of the curved line used by Jeffers et al. (2001) and represents the winter median position of the boundary between the 10/10 consolidated ice of M'Clure Strait and the moving polar pack (CIS 2002, A3-14). The ice regime and previous classifications schemes suggest several possible positions for the northern boundary separating M'Clure Strait and Viscount Melville Sound from the QEI inter-island area. Some of these (Melling 2001 and 2002, CLIF, and Falkingham et al. 2001) include most of Crozier and Kellett Straits in the Parry Channel Region due to the summer extent of the summer break-up as seen in the median ice concentration charts (CIS 2002, A18-21). The extent of the penetration of break-up into the straits varies considerably from year to year and from season to season. In addition, shipping routes through western Parry Channel would not be diverted into these straits. Thus the boundary of the Western Parry Region has been chosen as the simplest line across the southern end of these straits. It runs from Cape Cam on Prince Patrick Island to Cape Nares on Eglinton Island and from Pedder Point on Eglinton Island to Cape Russell on Melville Island as seen in Ballicater (2000), Jeffers et al. (2001), Melling (2002), and Falkingham et al. (2002) (see also the winter position of the inter-island 10/10 ice edge (CIS 2002, A15 and A28-33)). Similarly, the summer break-up extends into Byam and Austin Channels (CIS 2002, A18-21) as reflected in the boundaries used in CLIF, Jeffers et al. (2001), and Falkingham et al. (2001). However, to isolate Viscount Melville Sound from the inter-island area, the boundary has been drawn across the southern end of these channels using the line of latitude 75 N ending at Cape Cockburn on Bathurst Island (similar to Ballicater 2000). The latitude 75 N boundary was extended east to define the southern end of McDougall Sound as well.

The eastern boundary is constrained by the extent of the Western Arctic Regional Chart (Figure 1). It runs from Cape Rosse on Cornwallis Island to Pressure Point on Somerset Island, similar to Ballicater (2000) and Jeffers et al. (2001), but east of the boundary used in CLIF and Melling (2001) and more clearly suggested by the median ice conditions (CIS 2002, A18-23). The area between these two positions has been defined as the western Barrow Sub-region (see below) to allow examination of this active area.

In agreement with most previous schemes (CLIF, Falkingham et al. 2002, AIRSS Zones, Timco and Kubat 2001), northern Prince of Wales Strait is included in the Western Parry Region and because the strait is too small to be a Region / Sub-region of its own. The boundary runs from Hay Point on Victoria Island across to the unnamed point the the west on Banks Island.

The eastern portion of Region 04 has been relatively well covered over the period of record due to its proximity to Resolute. In the 1970s there was considerable activity between Resolute and Rae Point. In the RADARSAT era, coverage and interest for the whole Region has been reasonably high. However, in the early years the information for M'Clure Strait was quite limited during most of the season. Remote sensing studies (e.g. Agnew et al. 1997) have shown that there is considerable activity in M'Clure Strait often late into the winter which would not have been reflected on the early charts.

2.4.1 CIS WA Western Parry Channel: M'Clure

Short name: cwa04_01

Points: 9430 - 9620

Description: The western boundary corresponds with the Region boundary and runs from Cape Prince Alfred on Banks Island to the unnamed point north of Perseverance Point on Prince Patrick Island (defined above). The eastern boundary of the M'Clure Sub-region runs from Cape Hay on Melville Island to Russell Point, the northeastern tip of Banks Island (see also Figure 9).

Discussion: The eastern boundary of the M'Clure Sub-region is well east of the position of both Jeffers et al. (2001) and Melling (2002) who used the location of the ice arch which forms across the narrowest part of M'Clure Strait. This ice arch separates Arctic Ocean ice from ice in the Parry Channel (CIS 2002, A14-15 and A116-121). However the more easterly geographical boundary between M'Clure Strait and Viscount Melville Sound was chosen to capture the whole area west of the entrance to Prince of Wales Strait (separating the Prince of Wales and M'Clure Northwest Passage routes).

2.4.2 CIS WA Western Parry Channel: Viscount Melville

Short name: cwa04_02

Points: 9630 - 9930

Description: The western boundary is defined above in the M'Clure Sub-region. The eastern boundary of the Viscount Melville Sub-region is the line of longitude 98 W.

Discussion: The eastern boundary (longitude 98 W) is the straight line representing the arch that forms along the line of islands (Garrett, Lowther, and Young) separating Viscount Melville Sound from Barrow Strait. It separates the area south of McDougal Sound from Viscount Melville Sound (see discussion of Sub-region 04_03 below).

2.4.3 CIS WA Western Parry Channel: W Barrow

Short name: cwa04_03

Points: 9940 - 10060

Description: The western boundary is the line of longitude 98 W defined above. The eastern boundary is the Western Arctic Regional Chart boundary running from Cape Rosse on Cornwallis Island to Pressure Point on Somerset Island.

Discussion: This Sub-region was defined to separate the western Barrow Strait from Viscount Melville Sound. In some cases it might be useful to group it with Lancaster Sound - E Barrow. Ice enters this Sub-region from the north via Penny Strait (east of Bathurst Island) as opposed to entering through the Byam Martin /Austin Channel outlet which feeds Viscount Melville Sound.

2.5 CIS WA Western Arctic Waterway

Short name: cwa05_00

Points: 2000 - 2330

Description: The western boundary of this Region runs from Cape Bathurst on the mainland to Cape Kellett on southwestern Banks Island. The Region extends into Prince of Wales Strait to meet Region 04 Western Parry Sound, crossing from the unnamed point on Banks Island to Hay Point on Victoria Island. The eastern (northeastern) boundary runs from where latitude 69 N hits the southeastern tip of Victoria Island across the Royal Geographical Society Islands (southern Victoria Strait) to King William Island (southern Peel Sound). The remainder of the boundary runs from where longitude 97 W hits the eastern coast of King William Island to where longitude 95 W hits the coast of Boothia Peninsula.

The Region is divided into three sub-regions.

cwa05_01	CIS WA Western Arctic Waterway: Amundsen
cwa05_02	CIS WA Western Arctic Waterway: Coronation - Maud
cwa05_03	CIS WA Western Arctic Waterway: Amundsen Mouth

Discussion: The western boundary running from Cape Bathurst on the mainland to Cape Kellett on southwestern Banks Island defines the western boundary of the Amundsen Gulf in the simplest manner. The same boundary is used by the CIS Atlas (CIS 2002, B6), Ballicater (2000), and Melling (2001). However, both Crocker (2000b) and AIRSS Zones place it further east suggesting the Beaufort Sea conditions extend east into Amundsen Gulf. This eastern position can be supported by spring ice conditions (CIS 2002, A6-14). The definition of the Amundsen Mouth Sub-region will allow investigation of this transition area by separating it from the Beaufort Sea and from the remainder of the Western Arctic Waterway. The eastern (northeastern) boundary is similar to CLIF and Falkingham et al. (2002) and, particularly in the case of southern Victoria Strait, supported by median ice concentration charts (CIS 2002, A15-22).

The waterway has always been a shipping area and thus coverage should be good even in the early years.

2.5.1 CIS WA Western Arctic Waterway: Amundsen

Short name: cwa05_01

Points: 10070 -10170

Description: The eastern boundary of the Amundsen Sub-region runs from Clifton Point on the mainland to Cape Baring on Wollaston Peninsula (Victoria Island) and the western boundary is defined by a line extending from Cape Lambton on southern Banks Island to Cape Lyon on the mainland.

Discussion: As discussed above, the Amundsen Sub-region recognizes the difference between Amundsen Gulf and the Beaufort Sea. The eastern boundary of the Amundsen Sub-region from Clifton Point on the mainland to Cape Baring on Victoria Island is supported by the median advance of spring break-up (CIS 2002, A11-13). The western boundary of the sub-region represents the approximately normal position of the fast ice edge on May 15 and subsequently the area where intrusions of old ice are less likely to be found (CIS 2002, A131-162).

2.5.2 CIS WA Western Arctic Waterway: Coronation – Maud

Short name: cwa05_02

Points: 10180 - 10410

Description: The western boundary (Clifton Point on the mainland to Cape Baring on Victoria Island) is defined above. The eastern boundary runs from Victoria Island across King William Island and then to Boothia Peninsula.

Discussion: The Coronation – Maud Sub-region represents the narrow passage between the mainland and Victoria Island. The eastern and western boundaries are determined by the extent of the more dynamic ice conditions in the Amundsen and Larsen – Victoria Sub-regions.

2.5.3 CIS WA Western Arctic Waterway: Amundsen Mouth

Short name: cwa05_03

Points: 10420 – 10540

Description: The region boundary forms the western edge of the sub-region and the eastern boundary is shared with the Amundsen Sub-region (see above).

Discussion: The Amundsen Mouth Sub-region has been defined as a separate sub-region because this area is considered a zone of transition between the Beaufort Sea and Amundsen Gulf.

2.6 CIS WA M'Clintock Channel

Short name: cwa06_00

Points: 2340 - 2450

Description: The southern boundary runs from Cape Swinburne on Prince of Wales Island to Cape Admiral Collinson on Victoria Island. The northern boundary separating it from Western Parry Channel leaves Prince of Wales Island at Cape Eden, hits northeastern Stefanson Island where the longitude 105 W hits the coast. It then leaves western Stefanson Island from the intersection of longitude 107 W and the coast and runs along longitude 107 W to the coast of Storkerson Peninsula on Victoria Island.

Discussion: M'Clintock Channel has been defined as a separate Region due to high concentrations of old ice in the channel in all seasons of the year (CIS 2002, A99-194). The southern boundary defining the extent of the old ice is supported by the southern extent of 85% frequency of presence of old ice (CIS 2002, A131-161). The northern boundary is the simplest boundary separating M'Clintock Channel from Western Parry Channel.

There has never been shipping activity in M'Clintock Channel although interest in the region as a source of old ice for the Victoria Strait choke point on the eastern route of the Northwest Passage (Falkingham et al. 2001) has recently focused some attention on the variability of old ice and total concentrations in the Region.

2.7 CIS WA Franklin

Short name: cwa07_00

Points: 2460 - 2800

Description: The northern boundary runs across northern Peel Sound from Pressure Point on Somerset Island to Lyons Point on Prince of Wales Island. The western boundary separating it from the old ice in M'Clintock Channel runs from Cape Swinburne on Prince of Wales Island to Cape Admiral Collinson on Victoria Island. The southern boundary separating it from the Western Arctic Waterway runs from where latitude 69 N hits the southeastern tip of Victoria Island across the Royal Geographical Society Islands (southern Victoria Strait) to King William Island (southern Peel Sound). The remainder of the boundary runs from where longitude 97 W hits the eastern coast of King William Island to where longitude 95 W hits the coast of Boothia Peninsula.

Two Sub-regions have been defined for this region

cwa07_01	CIS WA Franklin: Larsen - Victoria
cwa07_02	CIS WA Franklin: Peel Sound

Discussion: The easternmost branch of the Northwest Passage passes through this Region. The line across northern Peel Sound joins named points (Pressure Point and Lyons Point) but is also supported by the median freeze-up and break-up positions of the boundary between the land-fast ice in Peel Sound and the unconsolidated ice in Parry Channel (CIS 2002, A15 and A32-34). The western boundary separates it from the area of 85% frequency of old ice in M'Clintock Channel (CIS 2002, A131-161). The southern boundaries are similar to CLIF and Falkingham et al. (2002) and, particularly in the case of southern Victoria Strait, supported by median ice concentration charts (CIS 2002, A15-22).

There has been reasonable shipping interest throughout the record in this Region although to a lesser degree than for the Western Arctic Waterway and Eastern Parry Channel to which it connects.

2.7.1 CIS WA Franklin: Larsen – Victoria

Short name: cwa07_01

Points: 10670 - 10860

Description: The western and southern boundaries coincide with the Region boundary defined above. The Larsen – Victoria Sub-region is separated from Peel Sound by the line joining the unnamed headland on the western coast of Boothia Peninsula to Cape Swinburne on Prince of Wales Island

Discussion: The Larsen-Victoria Sub-region is bound on the northwest by the region of old ice in M'Clintok Channel and on the south by the mainland and the entrance to the Western Arctic Waterway both discussed above. The old ice from M'Clintock Channel does invade this Sub-region at times as represented by the greater than 67% frequency of old ice in Larsen Sound (CIS 2002, A143-162). The northern boundary separating it from Peel Sound is supported by the spring break-up concentration patterns (CIS 2002, A19-23).

2.7.2 CIS WA Franklin: Peel Sound

Short name: cwa07_02

Points: 10870 - 11040

Description: The southern boundary, as defined above, joins the unnamed headland on the western coast of Boothia Peninsula and Cape Swinburne on Prince of Wales Island. The northern boundary shares the Region boundary.

Discussion: The Peel Sound Sub-region boundaries represent the extent of the area which breaks-up early relative to the Larsen-Victoria and M'Clintock Sub-regions both of which remain consolidated or land-fast several weeks longer (CIS 2002, A18-19). It also represents the boundary of the open water area in Peel Sound in September (CIS 2002, A21-23).

2.8 CIS EA Eastern High Arctic

Short name: cea08_00

Points: 2810 - 3060

Description: The region is bound in the north by the northern edge of the early maps (Figure 1) and runs from north of Emma Fiord on Ellesmere Island across Nansen Sound to south of Cape Stallworthy on Axel Heiberg Island.

The western boundary, separating Norwegian Bay from Massey Sound, runs from the southeast corner of Amund Ringnes Island to Cape Southwest on Ellesmere Island. It then crosses the western end of Hendriksen Strait from the southwestern tip of Amund Ringnes to the northwestern corner of Cornwall Island (western end of Belcher Channel) where it crosses land and leaves from the southwestern corner of Cornwall Island to the unnamed point on Grinnell Peninsula (Devon Island) southeast of Crescent Island.

The eastern boundary separating Jones Sound from Baffin Bay runs from King Edward Point on Ellesmere Island to Belcher Point on Devon Island.

The Region has been divided into two Sub-regions.

cea08_01	CIS EA Eastern High Arctic: Eureka - Norwegian Bay
cea08_02	CIS EA Eastern High Arctic: Jones Sound

Furthermore, Sub-region 08_01 has been divided into three "Test" Sub-regions

tea08_11	TEST EA Eastern High Arctic: Eureka
tea08_12	TEST EA Eastern High Arctic: Norwegian Bay
tea08_13	TEST EA Eastern High Arctic: Hell's Gate

Discussion: In the north the Region is bound by the northern edge of the early maps (Figure 1). The boundary runs from north of Emma Fiord on Ellesmere Island across to south of Cape Stallworthy on Axel Heiberg Island. This is to ensure a complete 30+ year record for the Region. Ideally the boundary should run from Cape Stallworthy (Axel Heiberg Island) to Lands Lokk (Ellesmere Island).

The western boundary separates Norwegian Bay from Massey Sound and KCI East (Western High Arctic). This boundary is similar to that used by Jeffers et al. (2001), Melling (2002), and CLIF.

The eastern boundary separating Jones Sound from Baffin Bay (from King Edward Point on Ellesmere Island to Belcher Point on Devon Island) is similar to that used by Jeffers et al. (2001) but west of the position on the CLIF map. In the present scheme (as well as Jeffers et al. 2001), Glacier Strait and Lady Ann Strait are included as part of the Baffin Bay Region based on the early formation of open water in Lady Ann Strait (CIS 2002, A13) and the mobility of the ice in winter (CIS 2002, A3).

There is some shipping activity in the Region but it is restricted to the late summer season.

2.8.1 CIS EA Eastern High Arctic: Eureka – Norwegian Bay

Short name: cea08_01

Points: 15230 - 15480

Description: The northern and western boundaries follow the Region boundary (see above). The southern boundary runs northeast from Cape Vera on Collin Archer Peninsula (Devon Island) to the southern headland on Simmons Peninsula (Ellesmere Island).

Discussion: This is the northern portion of the Eastern High Arctic Region (everything except Jones Sound). It is divided from Jones Sound by a boundary separating Hell Gate from Jones Sound. The boundary is discussed below in the Hell Gate “Test” Sub-region section.

This Sub-region has been divided into three “Test” Sub-regions: Eureka, Norwegian Bay, and Hell Gate and are discussed in the following.

2.8.2 CIS EA Eastern High Arctic: Jones Sound

Short name: cea08_02

Points: 11050 - 11150

Description: The northern boundary runs from Cape Vera on Devon Island to the southern headland on Simmons Peninsula (Ellesmere Island). In the east the boundary for the mouth of Jones Sound runs from King Edward Point on Ellesmere Island to Belcher Point on Devon Island.

Discussion: The boundary between the Jones Sound and Hell Gate Sub-regions as discussed in the previous section eliminates Goose Fiord from the Hell Gate polynya Sub-region, grouping it instead with the other large fiords which extend north into Jones Sound. In the east the boundary for the mouth of Jones Sound resembles Jeffers et al. (2001). The exclusion of Lady Ann and Glacier Straits from the Jones Sound Sub-region is discussed above in regard to boundaries of the Eastern High Arctic Region.

2.8.3 TEST EA Eastern High Arctic: Eureka

Short name: tea08_11

Points: 11160 - 11270

Description: The northern boundary follows the Region boundary. The southern boundary runs from Hyperite Point (Axel Heiberg Island) to the unnamed point on Raanes Peninsula (Ellesmere Island) east of Hyperite Point.

Discussion: The southern boundary is similar to Jeffers et al. (2001) and to the median concentration charts which show that in some weeks Norwegian Bay ice conditions extend into western Baumann Fiord (CIS 2002, A19, A86, and A111).[7]

Eureka Sound was relatively well surveyed, even in the pre-satellite era, at least as far north as Slidre Fiord (Eureka) during the shipping season. The beginning of freeze-up was probably relatively well monitored in most years. Early break-up and late freeze-up conditions may not have been adequately monitored in the pre-RADARSAT eras. The northern part of this Sub-region stretches into Nansen Sound which was not on a shipping route and thus may have been as closely monitored in the pre-satellite years. The likely bias would be to indicate more ice and a later break-up in the early years relative to the present. Both the Historical Ice Charts and the PCSP Charts had access to more information and would provide a good verification for the early years. However, this small area will not significantly influence the values for the overall Region.

2.8.4 TEST EA Eastern High Arctic: Norwegian Bay

Short name: tea08_12

Points: 11280 - 11540

Description: The northern boundary is defined above. The southern boundary runs from Devon Island to Ellesmere Island across the top of North Kent Island.

Discussion: The Norwegian Bay Sub-region is separated from the Eureka Sound Sub-region as discussed above. To the south, Norwegian Bay is separated from Hell Gate by the most obvious boundary (a line across the top of North Kent Island) and is consistent with Jeffers et al. (2001) and Melling (2002).

Norwegian Bay is on the route between Resolute Bay and Eureka and thus was relatively well surveyed in the shipping season even during the pre-satellite period. Examination of the Regional Ice Charts, the Historical Ice Charts, and PCSP Charts for the period 1968 to 1970 suggests the complex ice conditions and mobility of the ice in this Sub-region.

[7] An alternative would have been to include Baumann Fiord in Eureka Sound because the topography and bathymetry and in some weeks the ice conditions (CIS 2002, A21, A85, A103) resemble the Fiords of the Eureka Sound sub-region. (Melling 2002).

2.8.5 TEST EA Eastern High Arctic: Hell Gate

Short name: tea08_13

Points: 11550 - 11630

Description: The northern boundary is a straight line from the northwest corner of Simmons Peninsula on Ellesmere Island along the northern shore of North Kent Island to the northeastern edge of the unnamed peninsula north of Collin Archer Peninsula on Devon Island. The southern boundary runs northeast from Cape Vera on Collin Archer Peninsula (Devon Island) to the southern headland on Simmons Peninsula (Ellesmere Island).

Discussion: This Sub-region is very small but has a particularly distinctive ice regime. A polynya always forms early in the spring in the passages that join Norwegian Bay and Jones Sound. Melling (2002) includes it as one of the egresses for ice from the Islands and Arctic Ocean to more southerly channels. The northern boundary is similar to Jeffers et al. (2001) and Melling (2002). The southern boundary from Cape Vera on Collin Archer Peninsula (Devon Island) to the southern headland on Simmons Peninsula does not capture the maximum extent of the spring polynya as does the arched southern boundary used by Jeffers et al. (2001). However, the chosen boundary fits the straight line rule and also eliminates Goose Fiord, which is not normally part of the polynya (CIS 2002, A9 and A15) and would thus introduce a different ice regime into the Sub-region whose purpose is aimed at capturing the timing of the polynya break-up and the possible export of ice through the narrow channels. Most of Fram Sound is included in the Sub-region.

The extent of the Hell Gate polynya is probably reasonably reliable in the satellite era because it shows up well on satellite imagery. In the pre-satellite era the polynya appears in some form on the first Regional Chart of the season (around June 18) of all years (1968 and 1977). The polynya is clearly depicted as open water by the median ice concentration maps for June 11 through July 23 (CIS 2002, A9-15). It will not be possible to study the first date of opening of the polynya over the 30+ year period from the regional chart archive due to the lack of charts for the early spring months.

2.9 CIS EA Eastern Parry

Short name: ea09_00

Points: 3070 - 3280

Description: The boundary separating Eastern and Western Parry Sound, as discussed above, is somewhat determined by the extent of the Eastern and Western Regional Charts (Figure 1). It runs from Pressure Point on Somerset Island to Cape Rosse on Cornwallis Island. The boundary across the southern end of Wellington Channel runs from Cape Dungenesse on Cornwallis Island to the unnamed point on southwestern Devon Island. The eastern boundary is defined as the line between Cape Sherard on southeastern Devon Island and the unnamed tip of northwestern Bylot Island. The southern boundary runs across the mouth of Navy Board Inlet to Cape Charles Yorke and from the unnamed cape on northeastern Borden Peninsula across the mouth of Admiralty Inlet to northeastern Brodeur Peninsula (Baffin Island) and across Regent Inlet from Cape York on northwestern Brodeur Peninsula (Baffin Island) to Cape Clarence on Somerset Island.

Two Sub-regions were defined to allow the area at the mouth of Lancaster Sound to be examined separately from the rest of the Lancaster – E Barrow Region.

cea09_01	CIS EA Eastern Parry Channel : Lancaster - E Barrow
cea09_02	CIS EA Eastern Parry Channel: Lancaster Mouth

Discussion: The boundary separating Eastern and Western Parry Sound is constrained by the extent of the Western Arctic Regional Chart (Figure 1). The western boundary runs from Cape Rosse on Cornwallis Island to Pressure Point on Somerset Island, similar to Ballicater (2000) and Jeffers et al. (2001), but east of the boundary used in CLIF and Melling (2001) and more clearly suggested by the median ice conditions (CIS 2002, A18-23). The area between these two positions has been defined as the Western Barrow Sub-region (see above) to allow examination of this active area.

The northern boundary across the southern end of Wellington Channel is similar to Jeffers et al. (2001) but it is south of the position used by Crocker (2002). The median ice concentration charts support both the northern position (CIS 2002, A34 and A16-17) and the southern position (CIS 2002, A4 and A15). The southern position has been chosen as the simplest option and the boundary defined as the straight line from point to point at the mouth of the channel.

Defining the eastern boundary of the Region prompted much discussion. Based on the principal of simplicity (choosing the simplest line when several different lines are suggested by previous work and the median charts), it was defined as the line between Cape Sherard on southeastern Devon Island and the unnamed tip of northwestern Bylot Island (similar to CLIF and similar to the curve used by Jeffers et al. 2001 but different from Ballicater 2000).

The southern boundary runs across the mouth of Navy Board Inlet and Admiralty Inlet along the boundary between the land-fast ice of the inlets and the mobile ice of Eastern Parry Channel (CIS 2002, A3-10). Similarly it crosses Regent Inlet at its northern extent in a straight line representing the edge of the early break-up in Lancaster Sound (CIS 2002, A10-11).

Lancaster Sound has been a focus of shipping activity over the whole 30+ year period of record. The spring advance of break-up into Lancaster Sound can be seen even in the early satellite photos. Details of ice type may not be accurate but the ice edge information is probably reasonably reliable for the whole 30 year period.

2.9.1 EA Eastern Parry Channel: Lancaster – E Barrow

Short name: cea09_01

Points: 11640 - 11800

Description: The western and northern boundaries of this Sub-region coincide with the Region boundary defined above (straight line from Cape Rosse on Cornwallis Island to Pressure Point on Somerset Island and from Cape Dungenesse on Cornwallis Island to the unnamed point on southwestern Devon Island). The eastern boundary runs from Cape Charles Yorke on Bylot Island straight north to Devon Island.

Discussion: As discussed above the western boundary of this Sub-region is somewhat determined by the position of the common chart boundary but it also represents the arch that often forms from Cornwallis to Griffith and then across to Pressure Point on Somerset Island (CIS 2002, A14). The northern boundary is the line across the mouth of Wellington Channel (see above for discussion). The line straight north from Cape Charles Yorke on Bylot Island to Devon Island was a compromise position for the eastern boundary of the Sub-region. It represents the extent of the intrusion of Baffin Bay ice conditions into the mouth of Lancaster Sound in early spring.

In fact the spring ice arch takes a number of positions both east and west of this straight line (Bastiani 1989 and Goreman 1991).

2.9.2 EA Eastern Parry Channel: Lancaster Mouth

Short name: cea09_02

Points: 11810 - 11880

Description: Both the eastern and western boundaries (defined above) are straight lines: in the west from Cape Charles Yorke on Bylot Island straight north to Devon Island and in the east from Cape Sherard on southeastern Devon Island to the unnamed tip of northwestern Bylot Island.

Discussion: Both the eastern and western boundaries of this Sub-region were compromises between the various positions of the ice edge separating Lancaster Sound from Baffin Bay at various time of the year. Depending on the parameter examined and the time of year it could be considered part of Eastern Parry Channel or Baffin Bay.

2.10 TEST EA Baffin Inlets

Short name: tea10_00

Points: 3290 - 3610

Description: The northern boundary of this “Test” Region (defined above in the Eastern Parry Channel Region) runs across the mouth of Navy Board Inlet to Cape Charles Yorke on Bylot Island and from the unnamed cape on northeastern Borden Peninsula (Baffin Island) across the mouth of Admiralty Inlet to northeastern Brodeur Peninsula (Baffin Island) and across Prince Regent Inlet from Cape York on northwestern Brodeur Peninsula (Baffin Island) to Cape Clarence on Somerset Island.

The eastern boundary across the mouth of Pond Inlet runs from Cape Graham Moore on Bylot Island to Cape Weld on Baffin Island and through the islands in Fury and Hecla Strait. The western boundary across Bellot Strait follows longitude 95 W.

Each individual inlet is defined as a “Test” Sub-region:

tea10_12	TEST EA Baffin Inlets: Prince Regent - Boothia
tea10_13	TEST EA Baffin Inlets: Admiralty
tea10_14	TEST EA Baffin Inlets: Pond Inlet

Discussion: The Baffin Inlets Region has been defined as a “Test” region, and thus not to be used in climate (trend) studies for a number of reasons: the eastern inlets are too small to give reliable results; the Gulf of Boothia has never been a shipping area; and the north-south extent of the Prince Regent Inlet covers too large a latitudinal difference. The northern boundary of the region (as discussed above) runs across the mouth of Navy Board Inlet and Admiralty Inlet along the boundary between the land-fast ice of the inlets and the mobile ice of Eastern Parry Channel (CIS 2002, A3-10). Similarly, it crosses Prince Regent Inlet at its northern extent in a straight line representing the edge of the early break-up in Lancaster Sound (CIS 2002, A10-11).

2.10.1 TEST EA Baffin Inlets: Prince Regent – Boothia

Short name: tea10_12

Points: 11890 - 12150

Description: The northern boundary crosses Prince Regent Inlet from Cape York on northwestern Brodeur Peninsula (Baffin Island) to Cape Clarence on Somerset Island. The eastern boundary crosses the middle of the islands in Fury and Hecla Strait. The western boundary runs across Bellot Strait and follows longitude 95 W.

Discussion: The northern boundary across the mouth of Prince Regent Inlet from Cape Clarence on Somerset Island to Cape York on Brodeur Peninsula (Baffin Island) represents the edge of ice that remains land-fast when Lancaster Sound breaks-up in the spring (CIS 2002, A10-11) and becomes land-fast while Lancaster Sound is still mobile in the fall. There are short boundaries across Bellot Strait and Fury and Hecla Strait but the Sub-region is essentially an enclosed system to the south. There has been very little shipping in the Sub-region and it spans four degrees of latitude where the ice conditions vary considerably from north to south.

2.10.2 TEST EA Baffin Inlets: Admiralty

Short name: tea10_13

Points: 12160 - 12220

Description: The northern boundary across Admiralty Inlet runs from the unnamed cape on northeastern Borden Peninsula (Baffin Island) across the mouth of Admiralty Inlet to northeastern Brodeur Peninsula (Baffin Island).

Discussion: Admiralty Inlet is an enclosed system. The northern boundary with Eastern Parry Channel represents the edge of the land-fast ice in the spring and late fall (CIS 2002, A10-11). There has recently been some interest in the northern portion due to the mine at Nanasivik and the community of Arctic Bay but the southern part of the inlet has never been an area of interest.

2.10.3 TEST EA Baffin Inlets: Pond Inlet

Short name: tea10_14

Points: 12230 - 12310

Description: The northern boundary runs across the mouth of Navy Board Inlet from the unnamed tip of northeastern Borden Peninsula (Baffin Island) to the unnamed northwestern tip of Bylot Island. The eastern boundary runs across Eclipse Sound from Cape Graham Moore on Bylot Island to Cape Weld on Baffin Island.

Discussion: Straight lines across the mouth of Navy Board Inlet and Pond Inlet are the logical boundaries with Eastern Parry Channel and Baffin Bay. The Pond Inlet - Eclipse Sound – Navy Board Inlet channel is too small to be considered for climate (trend) studies although there is some shipping activity associated with Pond Inlet and there may be increased interest due to Sirmilink Park on Bylot Island.

2.11 CIS EA Kane Basin

Short Name: cea11_00

Points: 3620 - 3700

Description: The northern boundary of the Kane Basin Region is defined by the1968-96 Eastern Arctic Regional Chart edge. The southern boundary of the region is the straight line from Cape Herschel on Ellesmere Island to the unnamed cape to the east on the coast of Greenland.

Discussion: The northern boundary of the Kane Basin Region is defined by the 1968-96 Eastern Arctic Regional Chart edge. Ideally, the southern boundary of the Region should be defined by the position and shape of the ice bridge which forms the North Open Water (NOW) polynya. However, for simplicity a straight line has been drawn from Cape Herschel on Ellesmere Island to the unnamed cape to the east on the coast of Greenland. The Region is similar to the area used by Jeffers et al. (2001).

The maximum open water time series for 1969 to 2002 for the equivalent of the Kane Basin region is not well correlated (all below 0.40) to any of the other QEI areas or to the northwestern Baffin Bay area confirming that it should be regarded as a separate Region.

In the pre-satellite period this Region was not extensively surveyed except possibly during the annual Alert Air lift period and by the PCSP survey (1961-78 early spring flight and irregular flights between June and October). In the RADARSAT era (1996-present) there is good coverage for the entire period and particular attention was given during the NOW study in 1998. The region is now the focus of a study of Arctic pack ice through-flow so attention may increase in the area.

2.12 CIS EA Baffin Bay

Short nme: cea12_00

Points: 3710 - 4030

Description: The northern boundary of the Region is the straight line from Cape Herschel on Ellesmere Island to the unnamed cape opposite it on the coast of Greenland. The western boundary of the Baffin Region crosses the mouth of Jones Sound from King Edward Point on Ellesmere Island to Belcher Point on Devon Island continuing through the mouth of Lancaster Sound from Cape Sherard on southeastern Devon Island to the unnamed tip of northwestern Bylot Island and finally crossing Pond Inlet from Cape Graham Moore on Bylot Island to Cape Weld on Baffin Island.

The southern boundary of the Baffin Bay region runs across the narrowest part of Davis Strait from Cape Dyer on the Cumberland Peninsula (Baffin Island) to the eastern edge of the common chart boundary (Figure 1). The boundary then turns north along the common chart boundary to where the common chart boundary hits the coast of Greenland.

The region has been divided into east, west, and northwest sub-regions.

cea12_01	CIS EA Baffin Bay: E Baffin Bay
cea12_02	CIS EA Baffin Bay: W Baffin Bay
cea12_03	CIS EA Baffin Bay: NW Baffin Bay

Discussion: The southern boundary was moved south from the position used by Crocker (2002) and CLIF to run across the narrowest part of Davis Strait from Cape Dyer on the

Cumberland Peninsula (Baffin Island) to the eastern edge of the common chart boundary (Figure 1). The boundary then turns north along the common chart boundary to where the common chart boundary hits the Greenland Coast. This was done to include, in the Baffin Bay region, the ice which remains into late August along the Baffin Island coast (CIS 2002, A18-20) and to facilitate the division of the region into eastern and western Baffin Bay Sub-regions which represent the areas dominated by the northward and southward flowing ocean currents.

The northern boundary of the Region (as discussed above) should be defined by the position and shape of the ice bridge which forms the North Open Water (NOW) polynya. However, for simplicity the line has been drawn from Cape Herschel on Ellesmere Island to the unnamed cape to the east on the coast of Greenland. The general position is similar to Jeffers et al. (2001).

There has always been shipping activity and interest in Baffin Bay. However, it is a very large area and parts of it may not have been as well monitored in the pre-satellite era especially in the non-shipping areas.

2.12.1 CIS EA Baffin Bay: E Baffin Bay

Short name: cea12_01

Points: 12410 - 12590

Description: The southern boundary corresponds to the Region boundary from Cape Dyer on the Cumberland Peninsula (Baffin Island) to the edge of the common boundary at approximately longitude 56 W. The western boundary is a straight line from the unnamed point south of Thule (Greenland) to Cape Dyer on the Cumberland Peninsula (Baffin Island).

Discussion: The western boundary of the E Baffin Sub-region has been defined to isolate the area of northward current in eastern Baffin Bay from the area dominated by the returning (southward) current in western Baffin Bay. The Sub-region is constrained by the chart edge in the east and includes a small part of the southward flowing current off Cape Dyer in the west. However, the general shape and extent of the Sub-region is supported by the spring median ice condition (CIS 2002, A15-18).

2.12.2 CIS EA Baffin Bay: W Baffin Bay

Short name: cea12_02

Points: 12600 - 12700

Description: The southern boundary corresponds to the Region boundary (see above). The eastern boundary is the straight line from Cape Dyer on the Cumberland Peninsula (Baffin Island) to the unnamed point south of Thule (Greenland). The northwestern boundary extends southwest from the unnamed point south of Thule (Greenland) to Cape Graham Moore on eastern Bylot Island.

Discussion: The W Baffin Sub-region extends from the eastern boundary of the NW Baffin Sub-region in the north to Cape Dyer on the Cumberland Peninsula (Baffin Island) in southern Baffin Bay and includes the area which retains ice into August (CIS 2002, A11-18).

2.12.3 CIS EA Baffin Bay: NW Baffin

Short name: cea12_03

Points: 12710 – 12850

Description: The northern and western boundaries correspond to the Region boundary (see above). The eastern boundary is shared with the W Baffin Sub-region (see above).

Discussion: The eastern boundary of the NW Baffin Sub-region has been defined to separate the North Open Water area which is the first to open in the spring (CIS 2002, A11-18).

2.13 CIS EA Foxe Basin

Short name: cea13_00

Points: 4040 - 4230

Description: The northern boundary of Foxe Basin runs across the islands in the middle of Fury and Hecla Strait. The southern boundary is defined by the extent of the common chart edge between the Eastern Arctic and Hudson Bay Regional Charts (Figure 1).

Discussion: The southern boundary follows the common chart edge (Figure 1) to ensure that only the Eastern Arctic Regional Chart is used to calculate values for the Region although a more southerly position might have been chosen based on ice conditions (CIS 2002, A16-19 and A30). Foxe Basin has not been an area of significant shipping interest except during the re-supply of Igloolik and Hall Beach. However, recent interest in the impact of changing ice conditions on hunting and travel patterns have focused some interest in the area.

2.14 CIS HB Hudson Bay

Short name: chb14_00

Points: 4240 - 4530

Description: The northern boundary of the Hudson Bay Region follows the common chart edge (Figure 1). The eastern boundary, separating it from Hudson Strait, has been defined as the straight line from Wolstenholme on northern Ungava Peninsula across Salisbury Island to the point of land just northeast of Cape Dorset (Baffin Island). The southern boundary is common with the 1968-96 chart edge across southern James Bay.

The Hudson Bay Region has been divided into four Sub-regions as first defined for the CLIF project (documented by Alt and Tivy 2002 and used by Miville (pers. comm.)) for area calculations. The choke point areas defined for Hudson Bay and Hudson Strait for use in CLIF research are shown in Figure 5 from Tivy et al. (submitted) (the co-ordinates of these choke point areas are available upon request).

chb14_01	CIS HB Hudson Bay: NW Hudson Bay
chb14_02	CIS HB Hudson Bay: Central Hudson Bay
chb14_03	CIS HB Hudson Bay: E Hudson Bay
chb14_04	CIS HB Hudson Bay: N Hudson Bay Narrows

Discussion: The northern boundary of the Hudson Bay Region follows the common chart edge (Figure 1) to ensure that only the Hudson Bay Regional Chart is used to calculate values for the Region although a more southerly position might have been chosen based on ice conditions (CIS 2002, A16-19 and A30). The eastern boundary separating it from Hudson Strait has been defined as the straight line from Wolstenholme on northern Ungava Peninsula to the point of land just northeast of Cape Dorset (Baffin Island). This straight line follows the line of islands (Nottingham, Salisbury, and Mill Islands) which create narrow passages between Hudson Strait and Hudson Bay. The barrier created by these islands often blocks the ice creating a further shipping hazard (CIS, A14-15).

2.14.1 CIS HB Hudson Bay: NW Hudson Bay

Short name: chb14_01

Points: 13060 - 13200

Description: The southeastern boundary of the NW Hudson Bay Sub-region runs from Cape Churchill on the mainland to Cape Acadia on the southern tip of Mansel Island. The northeastern boundary runs from the northern tip of Mansel Island to Cape Pembrooke on Coats Island and then from Cape Netchek on Coats Island to Bear Cove Point on Southampton Island. The boundary crosses Southampton Island to the mainland along the common chart boundary (Figure 1).

Discussion: The southeastern boundary of the NW Hudson Bay Sub-region (from Cape Churchill on the mainland to the southern tip of Mansel Island represents the area of break-up from the northwest in the spring (CIS 2002, A9-13) and the first area of freeze-up in the fall (CIS 2002, A31-33). The northeastern boundary (from the northern tip of Mansel Island to Cape Pembrooke on Coats Island, and from Cape Netchek to Bear Cove Point on Southampton Island represents the intrusion of ice from Foxe Channel into Evans Strait (CIS 2002, A83-91) during the summer season and coincides with the southern extent of the southward currents in northwestern Hudson Bay (CIS 2002, B5). The boundary crosses Southampton Island to the mainland along the common chart boundary (Figure 1).

2.14.2 CIS HB Hudson Bay: Central Hudson Bay

Short name: chb14_02

Points: 13210 - 13330

Description: The eastern boundary extends from the southern tip of Mansel Island (Cape Acadia) to Cape Duncan on Akimiski Island in James Bay and then from the western tip of the island to the mainland.

Discussion: The central Hudson Bay Sub-region boundaries represent the triangularly shaped area in south-central Hudson Bay which retains ice into the summer due to the prevailing northwesterly winds (CIS 2002, A13-15). In the fall, however, this area is late to freeze-up due to the warmer air temperatures (CIS 2002, A33).

2.14.3 CIS HB Hudson Bay: E Hudson Bay

Short name: chb14_03

Points: 13340 - 13510

Description: The western boundary is defined above in the central Hudson Bay Sub-region (Cape Acadia on Mansel Island to Cape Duncan on Akimiski Island). The southern boundary follows the common chart boundary in James Bay. The northern boundary runs from the northern tip of Mansel Island to the western tip of Digges Island and then to Wolstenholme on northern Ungava Peninsula.

Discussion: The southern boundary of the E Hudson Bay Sub-region follows the common chart boundary which eliminates the area of southern James Bay which was missing on the early charts. The northern boundary (a line from Mansel Island to the Ungava Peninsula) follows the bathymetry (CIS 2002, B4). The Sub-region is generally very shallow and protected by a line of islands extending from James Bay to Mansel Island. Break-up is early and freeze-up is late (CIS 2002, A10-13 and A33-34).

2.14.4 CIS HB Hudson Bay: N Hudson Bay Narrows

Short name: chb14_04

Points: 13520 - 13640

Description: The northern boundary of this Sub-region corresponds to the common chart edge and northern boundary of the Hudson Bay Region. The southern and eastern boundary runs from Bear Cove Point on Southampton Island to Cape Netchek on Coats Island and from Cape Pembroke on northern Coats Island to the northern tip of Mansel Island and from there to the western tip of Digges Island and then to Wolstanholme on northern Ungava Peninsula. From there the boundary is the straight line to the point of land just northeast of Cape Dorset (Baffin Island).

Discussion: The northern boundary follows the common chart edge (Figure 1). The rest of the boundary follows the arc of islands which stretches east from Southampton Island across Coats and Mansel Islands to Digges Island and then north past Nottingham, Sallisbury, and Mill Islands to southern Baffin Island. The islands not only narrow the shipping channels but also tend to limit the intrusion of ice through Foxe Channel to the north (CIS 2002, A13-15) and the advance of the ice edge during freeze-up (CIS 2002, A30-31). The N Hudson Bay Narrows Sub-region tends to have the longest ice season and highest seasonal concentrations (Tivy et al. submitted) in the Hudson Bay Region.

2.15 CIS HB Hudson Strait

Short name: chb15_00

Points: 4540 - 4760

Description: The western boundary of the Hudson Strait Region as noted above runs from Wolstenholme on northern Ungava Peninsula across Salisbury Island to the point just northeast of Cape Dorset (Baffin Island). The eastern boundary runs from the unnamed cape at the southeastern tip of Meta Incognita Peninsula on Baffin Island and runs north of the Lower Savage Islands to where it hits the coast of Resolution Island. It leaves Resolution Island at the southeastern tip and then runs south to Cape Chidley (Labrador) by passing to the west of the Button Islands north of the cape.

Discussion: The eastern boundary of the Hudson Strait Region runs along the islands which narrow the mouth of the Strait providing a natural boundary between Hudson Strait and Davis Strait. This boundary is seen in Ballicater (2000), the Northern Canadian Waters Atlas (CIS 2002, B6), and CLIF.

2.16 CIS HB Davis Strait

Short name: chb16_00

Points: 4770 - 4970

Description: The northern boundary of Davis Strait runs across the narrowest part of Davis Strait from Cape Dyer on the Cumberland Peninsula (Baffin Island) to the eastern edge of the Eastern Arctic Regional Chart common chart boundary (Figure 1). From there it extends a short distance further east to the edge of the Hudson Bay Regional Chart common boundary (Figure 1) and then proceeds south along this boundary to approximately the same latitude as Cape Chidley (Labrador) where it heads west to Cape Chidley. The western boundary is shared with the Hudson Strait Region and runs from Cape Chidley (Labrador) to southern Resolution Island and from there to the unnamed cape at the southeastern tip of Meta Incognita Peninsula on Baffin Island.

Discussion: The northern boundary of Davis Strait was moved south of the position used by Crocker (2002) and CLIF to run across the narrowest part of Davis Strait from Cape Dyer on Baffin Island to the eastern edge of the Eastern Arctic Regional Chart common boundary (Figure 1). From there it extends a short distance further east to include the full extent of the Hudson Bay Regional Chart common boundary (Figure 1). It then proceeds south along this boundary to the approximate latitude of Cape Chidley and heads west to Cape Chidley. Frobisher Bay and Cumberland Sound are included in the Davis Strait Region. With the possible exception of the boundary across the mouth of Hudson Strait the boundaries of the Davis Strait Region are dictated more by chart boundaries and geography than by ice conditions. However, the Region does capture the tongue of ice seen along the southeast coast of Baffin Island in most months as seen in the frequency of presence of sea ice maps (CIS 2002, A78-98).

2.17 CIS HB Northern Labrador Sea

Short name: chb17_00

Points: 4980 - 5160

Description: The Northern Labrador Sea Region extends from Cape Chidley in northern Labrador east to the Hudson Bay Regional Chart common boundary and then south along that boundary to the northern edge of the Eastern Coast Regional Chart common boundary and then west along that boundary to the coast of Labrador.

Discussion: The ice conditions in the Northern Labrador Sea Region are not necessarily distinct from those in the Southern Labrador Sea region but the chart availability and dates are very different. The Hudson Bay Regional Charts (Northern Labrador Sea) charts document ice conditions during the summer season while the Eastern Coast Regional Charts focus on the winter season. It can be considered a transition Region.

2.18 CIS EC Southern Labrador Sea

Short name: cec18_00

Points: 5170 - 5540

Description: The northern and eastern boundaries of the Southern Labrador Sea Region run along the Eastern Coast Regional Chart common boundary (Figure 1). The Southern Boundary runs along a line extending east from the northern tip of Newfoundland and then across the Strait of Belle Isle.

Discussion: The Strait of Belle Isle boundary reflects the extent of the ice which originates in the Labrador Sea, or is transported south from Davis and Baffin Bays, and to a lesser degree the infrequent intrusion of old ice from the Arctic (CIS 2001, A119). The boundary extends somewhat further south into the Strait than that used by Crocker (2002) and the East Coast of Canada Atlas.

2.19 CIS EC Grand Banks

Short Name: cec19_00

Points: 5550 - 5780

Description: The western boundary of the Grand Banks Region extends from the southern Newfoundland coast just west of St. Pierre and Miquelon to the southern edge of the common chart boundary. The northern boundary extends east from the northern tip of Newfoundland and then across the Strait of Belle Isle. The southern and eastern boundaries follow the common chart boundary.

Discussion: The western boundary line separates the ice which extends south from the Labrador Sea from ice that originates in the Gulf of St. Lawrence (CIS 2001, A85) and is consistent with Crocker (2002). The southern and eastern boundaries follow the common chart boundaries which capture the maximum ice extent (CIS 2001, A85).

2.20 CIS EC Gulf of St. Lawrence

Short name: cec20_00

Points: 5790 - 6110

Description: The eastern boundary runs from the common chart boundary through St. Pierre and Miquelon and then across the Strait of Belle Isle. The southern boundary runs along the common chart boundary (Figure 1). The western boundary in the St. Lawrence Estuary is defined by the common chart boundary.

Discussion: The Gulf of St. Lawrence Region is the area to the east of the line just west of St. Pierre and Miquelon (the same as Ballicater 2000 and CLIF) and the area to the south of the Strait of Belle Isle. The common chart edge which makes up the southern boundary includes the Gulf as well as some area south of Nova Scotia and the Bay of Fundy. It captures the maximum extent of seasonal ice (CIS 2001, A85), including a considerable area which is usually ice free.

3.0 Quality Indices

3.1 Introduction

The following describes how the CISIRR confidence values are calculated. Firstly, a score from 0 to 5 is applied to four basic categories of ice reconnaissance datasets for the period 1968-2005 for each sub-region. Following the population of the raw scores, a series of weights are applied in various manners for: the contribution of a remote sensor to the creation of a regional ice chart; the contribution of a particular time period to the entire dataset; the contribution of a sub-region's oceanic area to a region's total oceanic area; and the contribution of a region's oceanic area to the total oceanic area of the entire dataset.

3.2 Definition of Variables and Parameters

3.2.1 Categories for Ice Reconnaissance Datasets

The four basic categories of ice reconnaissance datasets (remote sensors) are as follows:

- Ship-borne observations of ice conditions.
- Airborne observations of ice conditions.
- Airborne SAR (Synthetic Aperture Radar) and/or SLAR (Side-Looking Airborne Radar).
- Satellite observations (visual, infrared (or combinations thereof), and SAR).

3.2.2 Defining Time Periods

Six time periods have been identified as being significant in the history of the CIS Regional Charts collection (based upon unpublished work by Crocker et al.) and are as follows:

1968-1974	This period includes: infrequent availability of satellite data (NOAA VHRR); intense shipping and airborne observations in shipping areas.
1975-1977	This period includes: increasing availability of near-real-time satellite data (NOAA VHRR, Landsat MSS); intense shipping and airborne observations in shipping areas.
1978-1982	This period includes: availability of near-real-time satellite data (NOAA AVHRR, Landsat, Nimbus-7 SMMR); introduction of airborne SLAR in addition to airborne observations; intense shipping and airborne observations in shipping areas.
1983-1990	This period includes: availability of near-real-time satellite data (NOAA AVHRR, Landsat MSS / TM, Nimbus-7 SMMR, limited operational use of SSM/I); airborne SLAR in addition to airborne observations; intense shipping and airborne observations in shipping areas. This also marks the introduction of the "egg code" for reporting ice conditions.

1991-1995	This period includes: availability of real-time satellite data (NOAA AVHRR, Landsat MSS / TM, limited operational use of ERS-1 and SSM/I); introduction of airborne SAR in addition to airborne SLAR and observations; intense shipping and airborne observations in shipping areas.
1996-2005	This period includes: availability of near-real-time satellite data (NOAA AVHRR, Radarsat, limited operational use of ERS-2); airborne SAR / SLAR in addition to airborne observations; intense shipping and airborne observations in shipping areas. This also marks the introduction of advanced computer software for the generation of ice charts (IDIAS and ISIS).

3.2.3 Oceanic Areas

Oceanic areas are computed for each sub-region and used as weights (as a percentage of the parent region's total area) for the areal contribution to the parent region. Oceanic areas are computed using a GIS (Geographic Information System).

3.2.4 Scoring

Scores from 0 to 5 are applied based on a combination of the availability of a particular sensor and also the quality of a particular sensor. A score of 0 was poor, a score of 3 was average, and a score of 5 was excellent. Values are applied on a qualitative basis following interviews with experienced CIS staff. Subsequent evaluations of the raw scores and methodology were then reviewed by experienced CIS staff.

During the initial population of the scores, sub-regions are considered as "shipping" or "non-shipping" areas. In general, sub-regions of medium to high shipping have remained consistent due to long-established navigable routes (notable exceptions will be discussed later).

Following consultation with experienced CIS staff, sub-regions of medium to high shipping activity received similar scores for airborne (includes airborne SAR and SLAR when applicable) and shipping observations regardless of the geographic region. Airborne observations were and still are considered essential to safe navigation and hence are complementary to shipping activity. Following the population of the initial scores, a refinement process is applied which is based upon specific information compiled from various sources.

3.3 Methodology

3.3.1 Applying Scores

A preliminary set of scores is applied to each sub-region. Following the initial population of the scores, a refinement process takes place (see section 2.2.4). The following exceptions and rules are applied during the refinement process:

- Sub-regions tea10_12, tea10_13, tea10_14 match tea08_11, tea08_12, tea08_13, tea03_17, and tea03_19 due to occasional re-supplies and subsequent airborne support.
- Sub-regions twa03_13, twa03_14, and cwa04_02 have increased shipping during the 1970's due to petroleum interests in the area.
- Sub-regions twa03_12 and tea03_16 have similar scores due to generally land-fast ice conditions and no shipping.

- Only sub-region tec20_00 received a 5 for shipping activity.
- Sub-region tea10_13 has slightly higher shipping activity due to the mine located at Nanisivik.
- Sub-region twa03_18 has higher shipping and airborne observations due to the mine located at Polaris (Little Cornwallis Island) and it's proximity to Resolute (primary air base for Arctic flights).
- Sub-regions tea03_20 and tea03_19 receive higher shipping and airborne observations due to their proximity to Resolute (primary air base for Arctic flights) and occasional re-supplies and subsequent airborne support.
- Sub-region cea12_01 has higher shipping than cea12_02 because of the shipping route which follows the open water lead along the Western shore of Greenland and the generally consistent pattern of breakup resulting in lingering ice in cea12_02.
- Sub-region chb14_03 has lower shipping and airborne observations because it is not on the main shipping route to Churchill.
- Sub-region chb16_00 matches cea12_01 due to airborne support based in Iqaluit (Frobisher Bay) early in the shipping season.
- Sub-region cec18_00 receives higher shipping and airborne observation scores than chb17_00 because of the attention paid to the Eastern Coast Regional ice chart and the proximity to the Gulf of St. Lawrence.
- Sub-regions chb14_01, chb14_02, chb14_04 receive higher shipping and airborne observations during the 1990's and 2000's due to increased shipping activity.

3.3.2 Applying Weights to the Contribution of Ice Reconnaissance Datasets to Regional Chart Creation During Time Periods

A weight is determined for each ice reconnaissance dataset's contribution to the creation of a regional chart for a specific time period. A decision is used to differentiate between areas of "low shipping activity" and "moderate to high shipping activity". Areas of "moderate to high shipping activity" are those areas where the raw scores for ship-borne observations are >= 3 AND satellite observations are <=3, all other areas are deemed "low shipping activity". Essentially, in areas of moderate to high shipping and when higher-quality satellite data was unavailable, a stronger emphasis on ship and airborne (including airborne SAR / SLAR when appropriate) observations is employed to create the regional chart. The following tables list the weights (in percentages) applied to each time period for each ice reconnaissance dataset:

1968-1974 (7 years or 18.4%)

	low shipping activity	moderate to high shipping activity
ship observations	30%	30%
airborne observations	60%	60%
airborne SAR / SLAR**	0%	0%
satellite	10%	10%

1975-1977 (3 years or 7.9%)

	low shipping activity	moderate to high shipping activity
ship observations	10%	30%
airborne observations	30%	50%
airborne SAR / SLAR**	0%	0%
satellite	60%	20%

1978-1982 (5 years or 13.2%)

	low shipping activity	moderate to high shipping activity
ship observations	10%	20%

airborne observations	10%	20%
airborne SAR / SLAR	20%	40%
satellite	60%	20%

1983-1990 (8 years or 21.1%)

	low shipping activity	moderate to high shipping activity
ship observations	10%	20%
airborne observations	10%	20%
airborne SAR / SLAR	20%	30%
satellite	60%	30%

1991-1995 (5 years or 13.2%)

	low shipping activity	moderate to high shipping activity
ship observations	5%	5%
airborne observations	5%	5%
airborne SAR / SLAR	40%	40%
satellite	50%	50%

1996-2005 (10 years or 26.3%)

	low shipping activity	moderate to high shipping activity
ship observations	5%	5%
airborne observations	5%	5%
airborne SAR / SLAR	5%	5%
satellite	85%	85%

** airborne SAR / SLAR introduced in the 1978-1982 period

Once the applicable weights are determined for each sub-region, a further weight is factored in for the contribution of the length of the time period (expressed as a percent), to the total length of time for the entire dataset's time period.

The following equation is used to determine the overall score for each sub-region:

$$\omega_{sub-region} = \sum_{i=1}^{6}\left(\sum_{j=1}^{4} x_j \alpha_j\right)\beta_i$$

where,

$\omega_{sub\text{-}region}$ is the overall weighted score for the sub-region
i is a specified time period from 1 to 6
j is a specified ice reconnaissance dataset from 1 to 4
x_j is the raw score applied to ice reconnaissance dataset *j* for time period *i*
α_j is the weight for the contribution of ice reconnaissance dataset *j* to the regional ice chart
β_i is the weight for the contribution of the time period *i* to the entire time period

3.3.3 Applying Weights for Oceanic Areas for Sub-regions' Contribution to Parent Region

In order to determine the overall score for a region, a weight is applied to each contributing sub-region's weighted score for its contribution based on oceanic area. Values for the weights are determined through a GIS. The following equation is used to determine the overall score for each region:

$$\omega_{region} = \sum_{i=1}^{n} \omega_{sub-region} \alpha_i$$

where,

ω_{region} is the overall weighted score for the region
i is a contributing sub-region from 1 to n
$\omega_{sub-region}$ is the overall weighted score for the sub-region *i*
α_i is the weight for the contribution of oceanic area for sub-region *i* to the parent region

3.3.4 Applying Weights for Oceanic Areas for Regions' Contribution to Entire Dataset

In order to determine the overall score for the dataset, the method used to weight the regions is applied in the same manner. The following equation is used to determine the overall score for the dataset:

$$\omega_{dataset} = \sum_{i=1}^{n} \omega_{region} \alpha_i$$

where,

$\omega_{dataset}$ is the overall weighted score for the dataset
i is a contributing region from 1 to n
ω_{region} is the overall weighted score for the region *i*
α_i is the weight for the contribution of oceanic area for region *i* to the entire area

3.4 Results

The overall Quality Indices (QI) for the Regions for the whole period 1968-2005 (Table 5 and Figure 11) are weighted averages of the QI scores from the individual periods (Table 6 and Figure 12) and individual Sub-regions (Tables 7 and 8 and Figures 13-17). For studies using a subset of the whole period (e.g. 1980-present) weighted QI scores can be obtained by applying the period weighting to the scores in Table 8. The results are presented in the figures as relative QI scores to allow comparison of the Regions and Sub-regions over time and for the whole 30 year period. A brief discussion of relative quality as it relates to the homogeneity of the time series from the Sub-regions and Regions follows.

The Gulf of St. Lawrence Region (cec20_00) has the highest QI of any Region or Sub-region and the least change between the early years and the present, and thus produces the most reliable and homogeneous time series (Table 7 and Figures 11, 12, and 17). This is followed by the Sub-regions covering Lancaster Sound and Barrow Strait (the two Eastern Parry Channel Sub-regions (cea09_01 and cea09_02) and the W Barrow Sub-region (cwa04_03) of the Western Parry Channel Region) which also have overall QI scores and period QI scores greater than 4 (Tables 7 and 8 and Figures 13, 14, and 15). The E Baffin and NW Baffin Sub-Regions (cea12_01 and cea12_03) have above average

QI scores for the individual periods and overall scores similar to the Gulf of St. Lawrence and Lancaster Sound. The Alaska (cwa01_01) and Mackenzie (cwa01_02) Sub-regions in the Beaufort area are above the overall average for the whole period and for the individual periods (Tables 7 and 8 and Figure 14) while the Sub-regions of Hudson Bay (chb14_01 to chb14_04) and Hudson Strait (chb15_00) which lie along the shipping route to Churchill have QI scores close to or above the overall average (Tables 5-8 and Figures 11-13 and 16). These would also produce time series of similar reliability to those of the Gulf of St. Lawrence and Lancaster Sound areas. A map displaying QI values for the Regions is shown in Figure 18 and similarly for the Sub-regions in Figure 19.

All Regions and Sub-regions, including the "test" Regions and Sub-regions, have QI scores over 4 for the RADARSAT period. However, the unsuitability of time series from the "test" Regions and Sub-regions is illustrated by the overall low QI scores and the large difference in scores between the early years and the RADARSAT period. Several other Regions and Sub-regions show poor scores particularly in the pre-satellite period 1968-1974 (Figures 14-17). In the case of these more remote Regions and Sub-Regions the overall score would improve if the pre-satellite period was removed thus producing a time series for 1975 to the present.

4.0 References:

These references are taken from CISADS no. 4 the Bibliography assembled to support the development of Ice regime Regions and do not include references later than 2004.

Agnew, T. A. and S. E. L. Howell. *2002. Comparison of digitized Canadian ice charts and passive microwave sea ice concentrations. *In* IGARSS 2002, Toronto, Ontario, conference proceedings.

Agnew, T. A., B. T. Alt, R. De Abreu and S. Jeffers. 2001. The loss of decades old sea ice plugs in the Canadian Arctic Islands. *In* Extended Abstracts: Polar Meteorology and Oceanography Conference, AMS, San Diego, May 14-18, 2001.

Agnew, T. A., B. T. Alt, R. De Abreu and S. Jeffers. 2001. The loss of decades old sea ice plugs in the Canadian Arctic Islands. Chapter I:22. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Agnew, T. A., B. T. Alt, S. Jeffers and R. De Abreu. 2001. Overview of 1998 summer: Canadian Arctic Islands, Chapter I:2. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund: 1-15. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Agnew, T. A. and S. E. L. Howell. 2002. Climatic analysis of operational digitized ice charts and comparison with passive microwave ice concentrations data. *Journal of Geophysical Research: Oceans*.

Agnew, T. A. 2003. Record minimum sea ice extent in 2002. *In* Presentation to 8th Annual CRYSYS Science Meeting, Montreal, March 23-25, 2003.

Agnew, T. A., B. Alt, R. De Abreu, R. Chagnon and S. McCourt. 2003. Recovery of the sea ice regime in the Canadian Arctic Islands from the warm summer of 1998. *In*

Presentation to the 37th Canadian Meteorological and Oceanographic Congress, Ottawa, June 2-5, 2003.

Agnew, T. A. and S. E. L. Howell. 2003. The use of operational ice charts for evaluating Passive Microwave Ice Concentration data. *Atmosphere-Ocean*, **41**(4): 317-331.

Alt, B. T. and S. McCourt. 2001. Building a 38-year time series of maximum open water for the QEI and Northwestern Baffin Bay: a technical report, Chapter II:4. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-80. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Alt, B. T., S. Jeffers, S. McCourt and R. Chagnon. 2001. Spatial and temporal studies of maximum open water in the Queen Elizabeth Islands, Chapter II:5. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-109. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Alt, B. T. and A. Tivy. 2002. Action plan for long-range ice forecasting research. Contract report prepared for: Canadian Ice Service, Environment Canada, Balanced Environments Associates Report be02-02, 140 pp.

Alt, B. T. and A. Tivy. 2002. Long range ice forecasting: state of the art review. Contract report prepared for Canadian Ice Service, Environment Canada, Balanced Environments Associates Report be02-01, 170 pp.

Alt, B. T. 2003. Canadian Ice Service Digital Charts Database, homogeneity, corrections and comparisons. Contract report prepared for Canadian Ice Service and CRYSYS - Environment Canada, Balanced Environments Associates Report be03-02, 54 pp.

Alt, B. T., G. Crocker, R. Chagnon, S. McCourt, T. Carrieres, A. Tivy, B. Miville, T. A. Agnew and K. J. Wilson. 2003. Examining shifts in sea ice time series from the Canadian Ice Service Digital Charts Database. Presentation to 37th Canadian Meteorological and Oceanographic Congress in Ottawa, June 2-5, 2003.

Alt, B. T., A. Tivy, G. Crocker, B. Miville, S. McCourt, R. Chagnon, T. Carrieres, T. A. Agnew, K. J. Wilson and M. Arkett. 2003. Examining shifts in the Canadian Ice Service digital database time series. Poster at 8th Annual CRYSYS Science Meeting, Montreal, March 23-25, 2003.

Alt, B. T. 2003. Historical charts: preparation for digitization. Contract report prepared for Canadian Ice Service and CRYSYS - Environment Canada, Balanced Environments Associates Report be03-03, 79 pp.

Alt, B. T. 2003. Technology-related influences on the homogeneity of time series produced from the Canadian Ice Service Digital Charts Database: Focus on the period surrounding the 1977 and 1989 regime shifts in the northern Canadian Arctic Islands. Contract report prepared for Canadian Ice Service and CRYSYS Environment Canada, Balanced Environments Associates Report be03-01, 41 pp.

Alt, B. T., K. J. Wilson, T. A. Agnew and R. Chagnon. 2004. Ice motion in Sverdrup and Peary Channels: a case study combining RADARSAT and the CIS Digital Charts

Database. Poster presented at the 9th Annual CRYSYS Science Meeting, Saskatoon, March 24-26, 2004.

Alt, B. T., S. E. L. Howell, F. Kanji, A. Kliotzkin, A. Tivy and K. J. Wilson. 2004. Using the CIS Digital Charts Database to calculate navigable route to Churchill dates for Type E vessels. Contract report prepared for Canadian Ice Service and CRYSYS - Environment Canada, Balanced Environments Associates Report be04-01, 129 pp.

Atkinson, D. E., R. Brown, B. T. Alt, T. A. Agnew, M. M. Burgess, C. L. Duguay, G. Henry, S. Jeffers, R. M. Koerner, A. G. Lewkowicz, S. McCourt, H. Melling, M. Sharp, C. M. Smith, M.-k. Woo and K. L. Young. *accepted for publication. Canadian Cryospheric response to a warm summer. *Atmosphere-Ocean*.

Bourgeois, J. C., R. M. Koerner and B. T. Alt. 2004. Determining sea ice extent from ice core records. Poster presented to ACIA workshop, Rekyavik, Iceland.

Brown, R. D. and B. T. Alt. 2001. Extended Executive Summary. *In* The state of the Arctic cryosphere during the warm summer of 1998: documenting cryospheric variability in the Canadian Arctic, CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-33. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and
http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Brown, R. 2001. The State of the Arctic Cryosphere during the extreme warm summer of 1998, summary of special 1/2-day session at 2001 CRYSYS Meeting, Edmonton Westin Hotel, February 11, 2001, Chapter II:10. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-3. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and
http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Canadian Ice Service. 2001. *Sea ice climatic atlas, East Coast of Canada, 1971-2000*, Minister of Public Works and Government Services of Canada, 200 pp.

Canadian Ice Service. 2002. *Sea ice climatic atlas, Northern Canadian Waters, 1971-2000*, Minister of Public Works and Government Services of Canada, 200 pp.

CCAF Summer 1998 Project Team. 2001. Brief Summary. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-14. *available at*
http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and
http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

CCAF Summer 1998 Project Team. 2001. The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report, Climate Change Action Fund. *available at*
http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and
http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

CCAF Summer 1998 Project Team. 2001. Synthesis, Chapter I:23. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-112. *available at*
http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and
http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

CCAF Summer 1998 Project Team. 2001. Time series of climate and cryospheric parameters, Chapter II:13. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Crocker, G. 2000. The Canadian Ice Service digital sea ice database: assessment of trends in the Gulf of St. Lawrence and Beaufort Sea regions. Contract report for Canadian Ice Service, Environment Canada, Ballicater Consulting Ltd. Report Number 00-04, 145 pp.

Crocker, G. 2000. Documentation for the Canadian Ice Service digital sea ice database. Contract report for Canadian Ice Service, Environment Canada, Ballicater Consulting Ltd. Report Number 00-02, [cited elsewhere as Crocker and Carrieres, 2001], 46 pp.

Crocker, G. 2001. Factors influencing ice climate trends in the CIS database. Contract report for Canadian Ice Service, Environment Canada, Ballicater Consulting Ltd. Report Number 01-02, 55 pp.

Crocker, G. 2002. Analysis of sea ice climate trends in Canadian waters. Contract report for Canadian Ice Service, Environment Canada, Ballicater Consulting Ltd Report Number 01-04, 119 pp.

Falkingham, J. C., R. Chagnon and S. McCourt. 2001. Sea Ice in the Canadian Arctic in the 21st Century. *In* Proceedings of the 16th International Conference on Port and Ocean Engineering under Arctic Conditions., POAC '01, Ottawa, Ontario, Canada (2001).

Falkingham, J. C., R. Chagnon and S. McCourt. 2001. Sea ice in the Canadian Arctic in the 21st century, Chapter II:12. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund: 1-9. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Falkingham, J. C., R. Chagnon and S. McCourt. 2002. Trends in sea ice in the Canadian Arctic. *In* 16th International Symposium on Ice, International Association for Hydrographic Research, Dunedin, New Zealand, 2-6 Dec, 2002.

Gaston, A. J. and G. Gilchrist. *in preparation. Climate change, ice conditions and reproduction in an Arctic nesting marine bird: the Thick-billed Murre, *Uria lomvia*.

Howell, S. E. L. and J. J. Yackel. 2002. Utilizing climate, Time Series SAR and the Canadian Ice Service Ice Charts for facilitating ship navigation in the Western Arctic. *In* Oral poster presentation at CRYSYS 2002, Victoria, British Columbia, Canada.

Howell, S. E. L. and J. J. Yackel. 2003. An assessment of ship navigation variability in the Western Arctic, 1969-2002: implications for ship navigation. *In* CRYSYS 2003, Montreal, Quebec, Canada. Poster presentation.

Howell, S. E. L. 2003. On the use of operational Canadian Ice Service Ice Charts for evaluating Bootstrap Derived Passive Microwave sea ice concentrations. Final report for the Meteorological Service of Canada, Contract #KM040-3-0009, August 18, 2003, 21 pp.

Howell, S. E. L. 2003. A vessel transit analysis of sea ice in the Western Arctic, 1969-2002: implications for ship navigation. *In* Presentation to 8th Annual CRYSYS Science Meeting, Montreal, March 23-25, 2003.

Howell, S. E. L. and J. J. Yackel. 2004. An assessment of ship navigation variability in the Western Arctic, 1969-2002: implications for ship navigation. *Canadian Journal of Remote Sensing*, **30**(2): 205-215.

Howell, S. E. L. 2004. An assessment of the NasaTeam2 and ASI passive microwave sea ice concentration extraction algorithms against the Canadian Ice Service Digital Ice Charts, Final report for Meteorological Service of Canada, January 15, 2004, 19 pp.

Jeffers, S. 2001. Canadian Ice Service, Presentation to CCAF Impacts and Adaptation, Yellowknife, Chapter II:9. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Jeffers, S., B. T. Alt, T. A. Agnew and R. M. Koerner. 2001. CCAF '98, poster presented at the 2001 CRYSYS annual meeting, Chapter II:9. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Jeffers, S., T. A. Agnew, B. T. Alt, R. De Abreu, R. M. Koerner and S. McCourt. 2001. The effects of the extreme summer of 1998 on the Canadian High Arctic ice regime, Chapter II:6. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-12. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Jeffers, S. 2001. Ice conditions in the Queen Elizabeth Islands in 1998 (1962, 1981):A detailed analysis, Chapter II:3. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-36. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Jeffers, S., T. A. Agnew, B. T. Alt, R. De Abreu and S. McCourt. 2001. Investigating the anomalous sea ice conditions in the Canadian High Arctic (Queen Elizabeth Islands) during the summer of 1998. *Annals of Glaciology*, **33**: 507-512.

Jeffers, S., T. A. Agnew, B. T. Alt, R. De Abreu and S. McCourt. 2001. Investigating the anomalous sea ice conditions in the Canadian High Arctic (Queen Elizabeth Islands) during the summer of 1998, Chapter I:17. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-13. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

McCourt, S. 1999. Investigation into potential climatic causes of the usual ice retreat in the Beaufort Sea during the summer of 1998. Report prepared for Canadian Ice Service, Environment Canada, 31 pp.

Melling, H. *2002. The sea ice of the Canadian Arctic Archipelago. *Journal of Geophysical Research*, **107**(C11): 3181.

Melling, H. *2002. Sea ice of the northern Canadian Arctic Archipelago. *Journal of Geophysical Research: Oceans*, **107**(C11): 2-1 to 2-21.

Melling, H. 2001. Is the extent or thickness of arctic sea ice declining? Chapter II:11. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadian Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-6. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Melling, H. 2001. The Northwest Passage in 1998, Chapter I:18. *In* The state of the Arctic cryosphere during the extreme warm summer of 1998: documenting cryospheric variability in the Canadain Arctic. CCAF Final Report. CCAF Summer 1998 Project Team, Climate Change Action Fund**:** 1-1. *available at* http://www.socc.uwaterloo.ca/summer/ftp/ftp.html and http://www.socc.ca/summer/volume_1/I00_Contents/I00_Contents.PDF

Miville, B., K. J. Wilson, B. T. Alt, A. Tivy, J. Falkingham, T. Carrieres, R. Powers, L. Hache and G. Langois. 2002. Canadian Long-range Ice Forecasting Project (CLIF). *In* Presentation to 37th Canadian Meteorological and Oceanographic Congress in Ottawa, June 2-5, 2003.

Miville, B. 2003. Sea Ice - Probabilistic Forecasts, Ice Severity Index Severity Indices, *accessed* May, 2004. *available at* http://www.cccma.bc.ec.gc.ca/~bmiville/seaice/

Tivy, A. and B. T. Alt. 2003. Canadian Long Range Ice Forecasting (CLIF) in Hudson Bay. *In* Poster at 37th Canadian Meteorological and Oceanographic Congress in Ottawa, June 2-5, 2003.

Tivy, A. and B. T. Alt. 2003. Directions for CLIF in Hudson Bay. *In* Presentation to 8th Annual CRYSYS Science Meeting, Montreal, March 23-25, 2003.

Tivy, A. 2003. Validation of a coupled atmospheric-ocean model. Contract report prepared for Canadian Ice Service, Environment Canada, Tivy Consultants, Tivy Report 03-01, 20 pp.

Tivy, A., T. Sou, T. Carrieres, G. Flato and G. Holloway. 2004. Climate change impacts on the energy sector (CCIES), Critical aspects of changes in sea ice cover on energy production. 2003, a reference to the model validation work. Contract report prepared for Canadian Ice Service, Environment Canada, Tivy Consultants, Tivy Report 04-01.

Tivy, A. 2004. A statistical model for seasonal forecasting of spring break-up in Hudson Bay. *In* Conference Proceedings from IEEE International Geoscience and Remote Sensing Symposium, September 20-24, 2004, Ancorage, Alaska, USA**:** 1-4.

Tivy, A. 2004. A statistical model for seasonal forecasting of spring break-up in Hudson Bay. Contract report for Canadian Ice Service, Environment Canada, Tivy Consulting Report 04-02, 20 pp.

Wilson, K. J., B. T. Alt, A. Tivy, B. Miville, J. Falkingham, B. Ramsay and T. Carrieres. *2003. Introduction: Canadian Long-range Ice Forecasting (CLIF). *In* Presentation to 8th Annual CRYSYS Science Meeting, Montreal, March 23-25, 2003.

Wilson, K. J., J. Falkingham, H. Melling and R. De Abreu. 2004. Shipping in the Canadian Arctic: Other Possible Climate Change Scenarios. *In* Power Point presentation at IEEE International Geoscience and Remote Sensing Symposium, September 20-24, 2004, Anchorage, Alaska, USA.

Wilson, K. J., J. Falkingham, H. Melling and R. De Abreu. 2004. Shipping in the Canadian Arctic: other possible climate change scenarios. *In* Conference Proceedings from IEEE International Geoscience and Remote Sensing Symposium, September 20-24, 2004, Anchorage, Alaska, USA**:** 1-4.

5.0 Figures

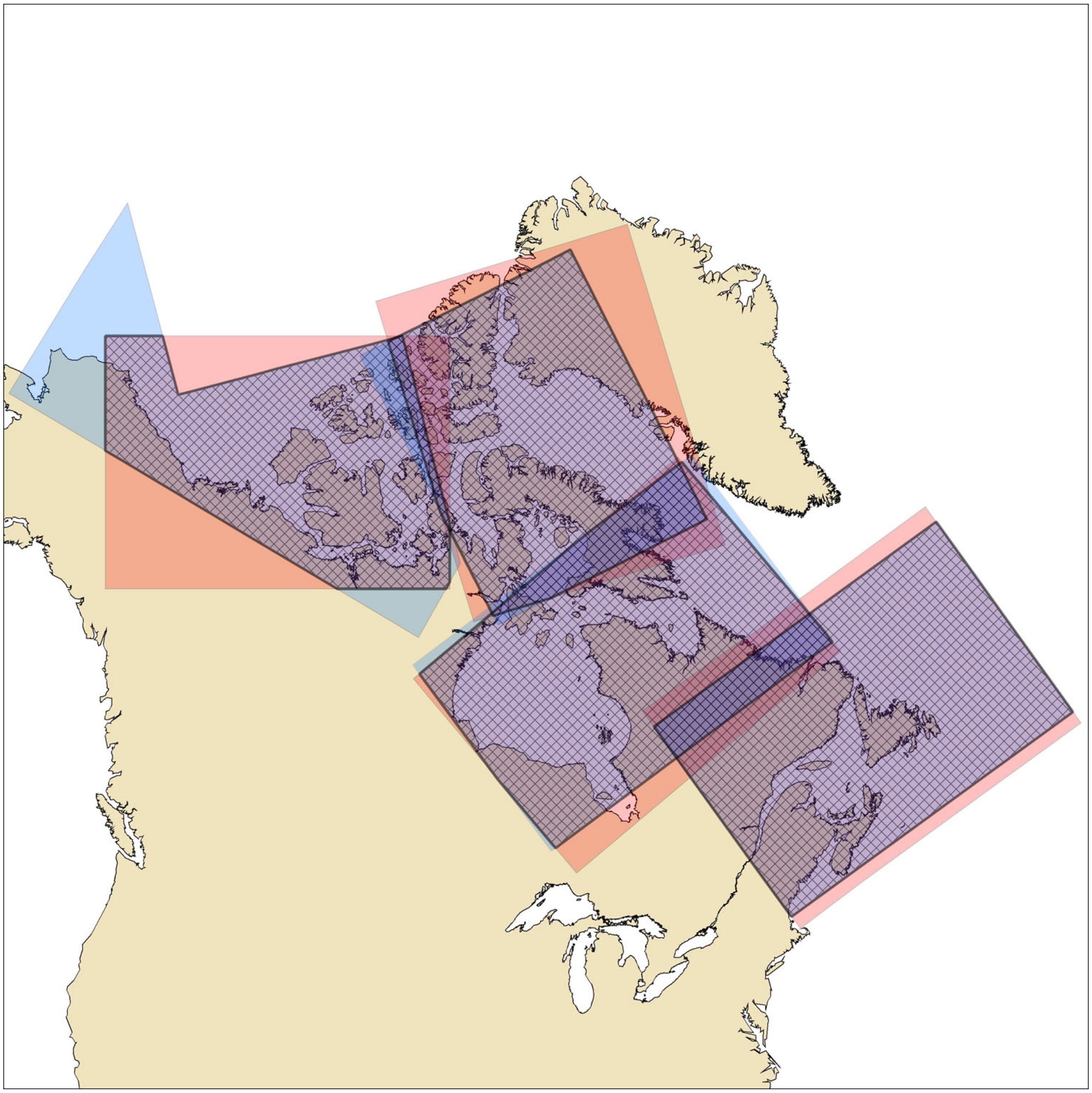

Figure 1: CIS Regional Ice Chart boundaries. Shown in blue are the Regional Ice Chart boundaries from 1968 to 1996; in red are the Regional Ice Chart boundaries from 1997 to the present; and in hatching are the “common chart boundaries”.

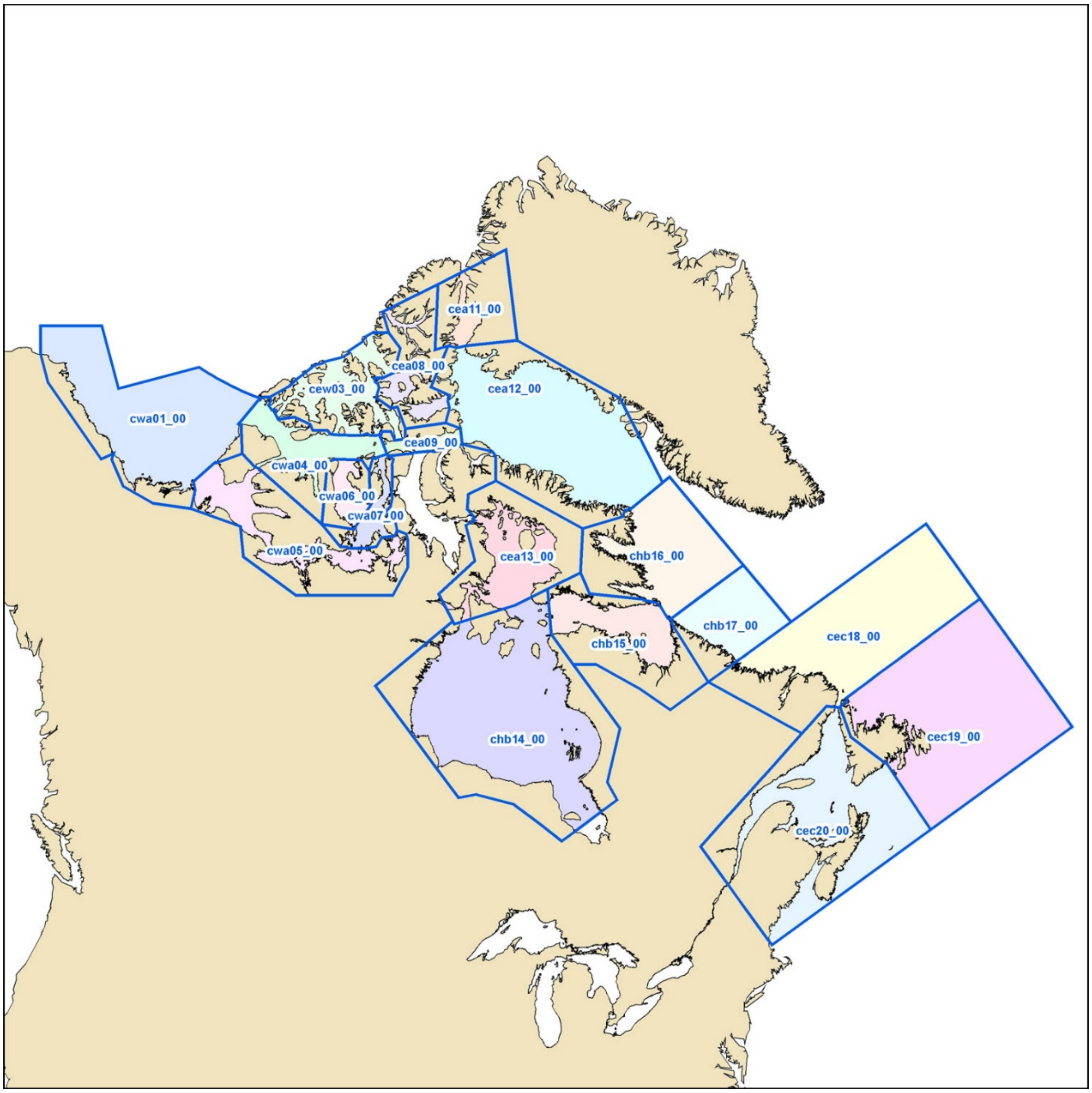

Figure 2: CIS Ice Regime Regions.

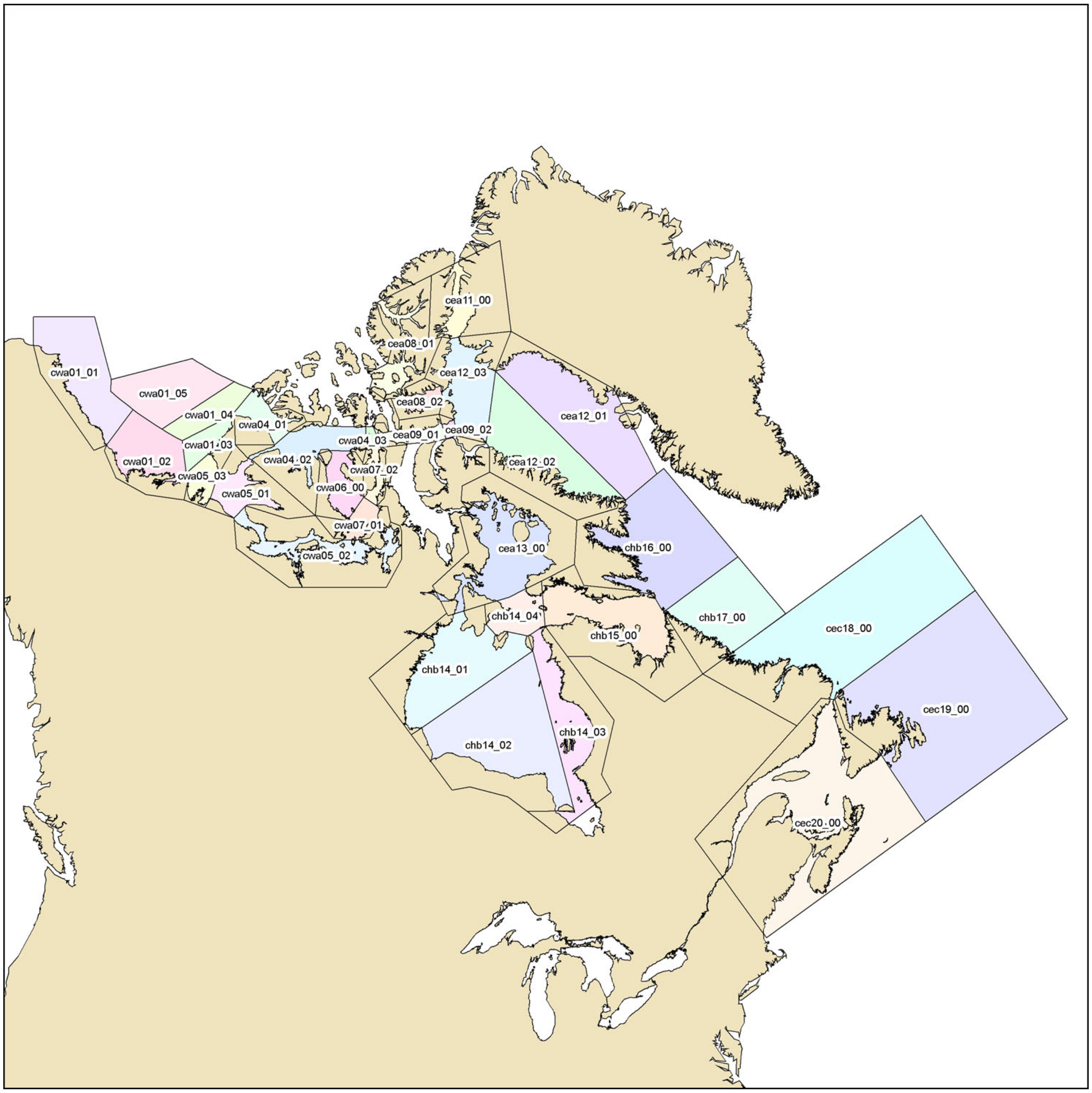

Figure 3: CIS Ice Regime Sub-regions.

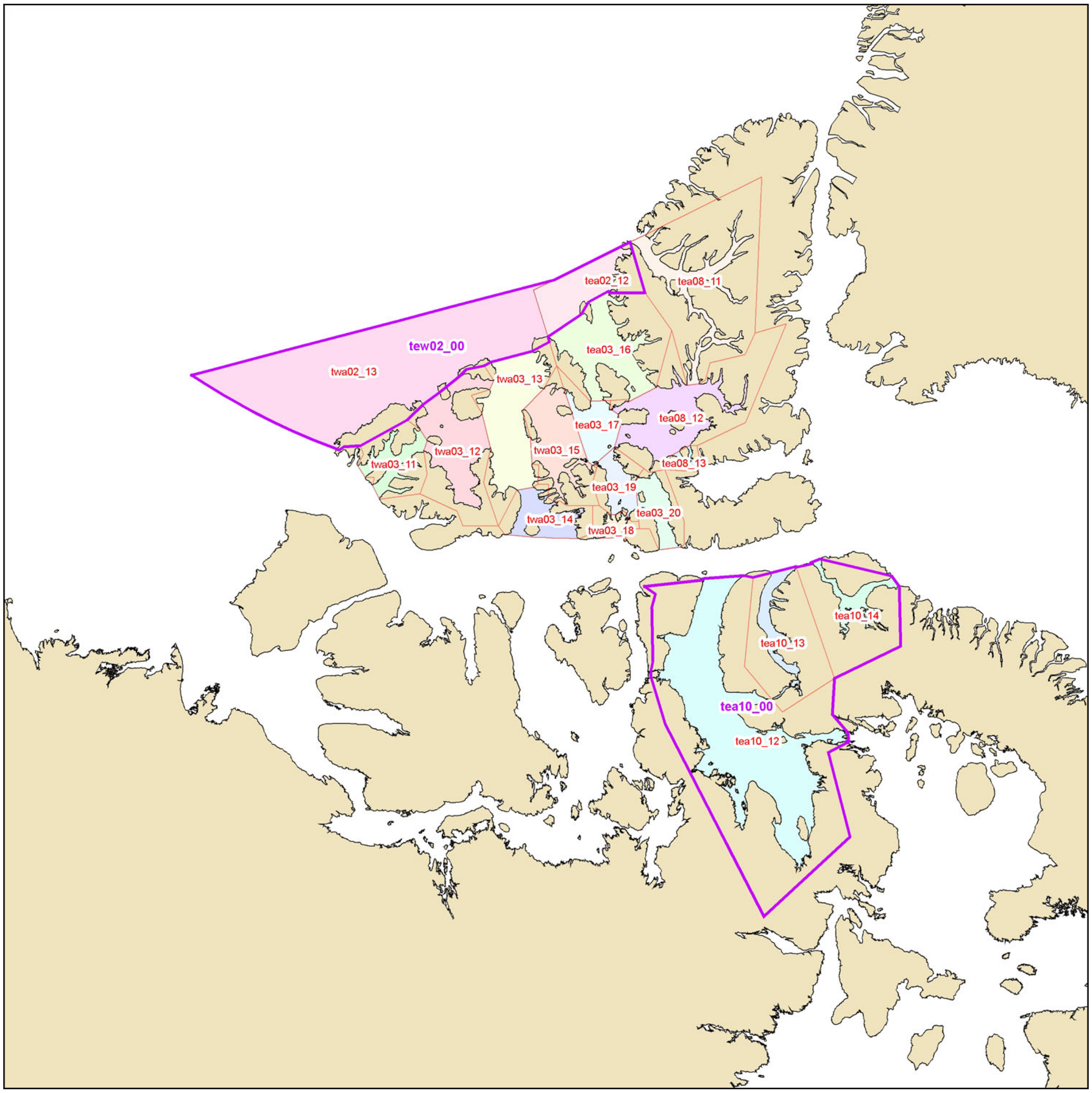

Figure 4: "Test" Ice Regime Regions and Sub-regions.

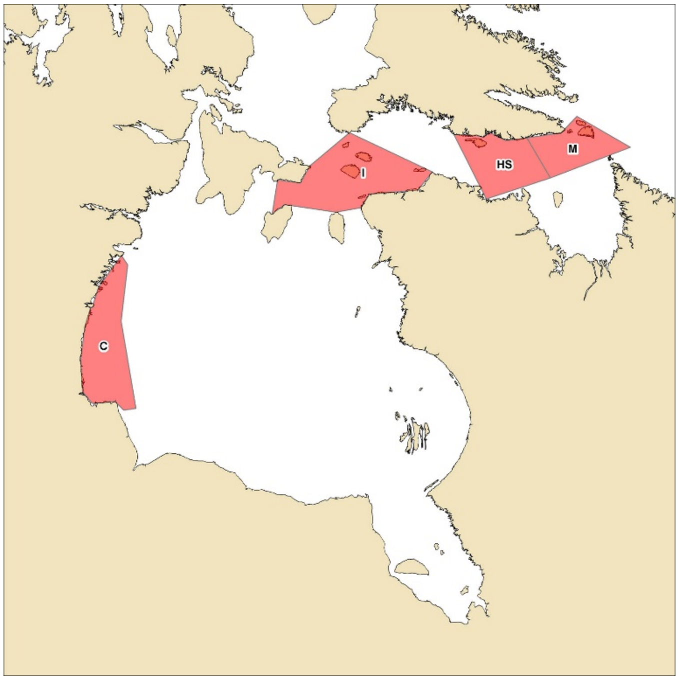

Figure 5: "Choke point areas" for Hudson Bay and Hudson Strait: western coast of Hudson Bay north of the Port of Churchill (C); region south of Foxe Basin from Nottingham and Salisbury Islands to Southampton Islands (I); east central Hudson Strait (HS); and the entrance to Hudson Strait (M).

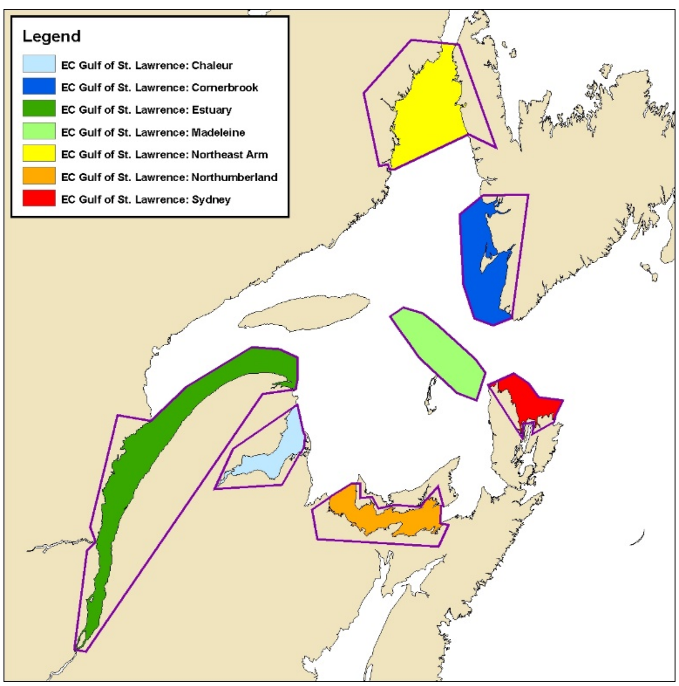

Figure 6: "Critical areas" for the Gulf of St. Lawrence.

Figure 7: Illustration showing points which make up Region cwa01_00. Shown in red are lines and points associated with the "common chart boundary"; in blue are lines and points associated with a line of latitude; in green are lines and points associated with shared boundaries; in purple are lines and points associated with polygon completion; and in black are points associated with identifiable features (e.g. named or un-named points of land). Land is depicted in tan.

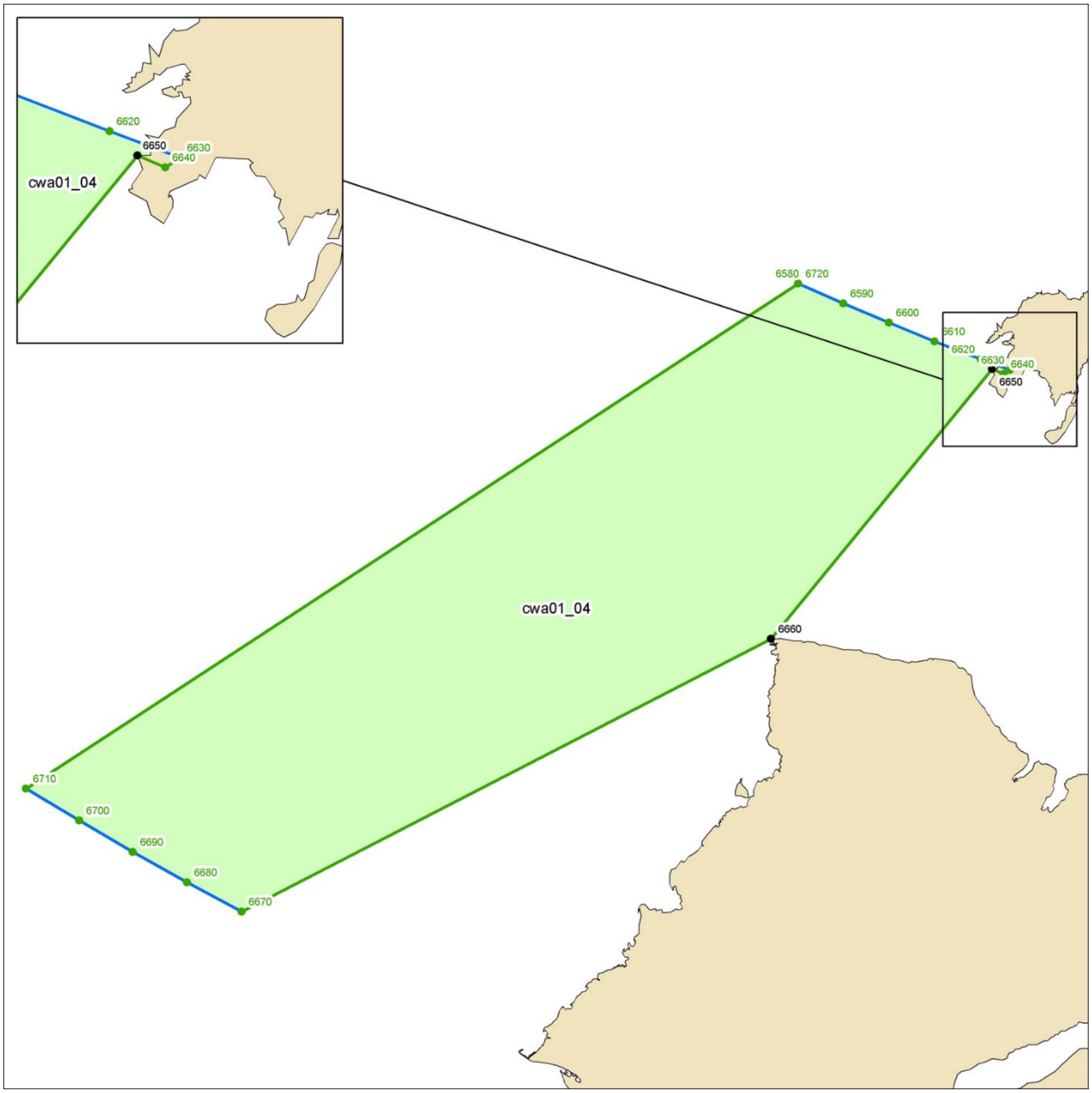

Figure 8: Illustration showing coordinates for Sub-Region cwa01_04. Shown in green are lines and points associated with shared boundaries or coordinates and in blue are lines defined by a line of latitude. The inset shows detail associated with southwestern Prince Patrick Island. Land is depicted in tan.

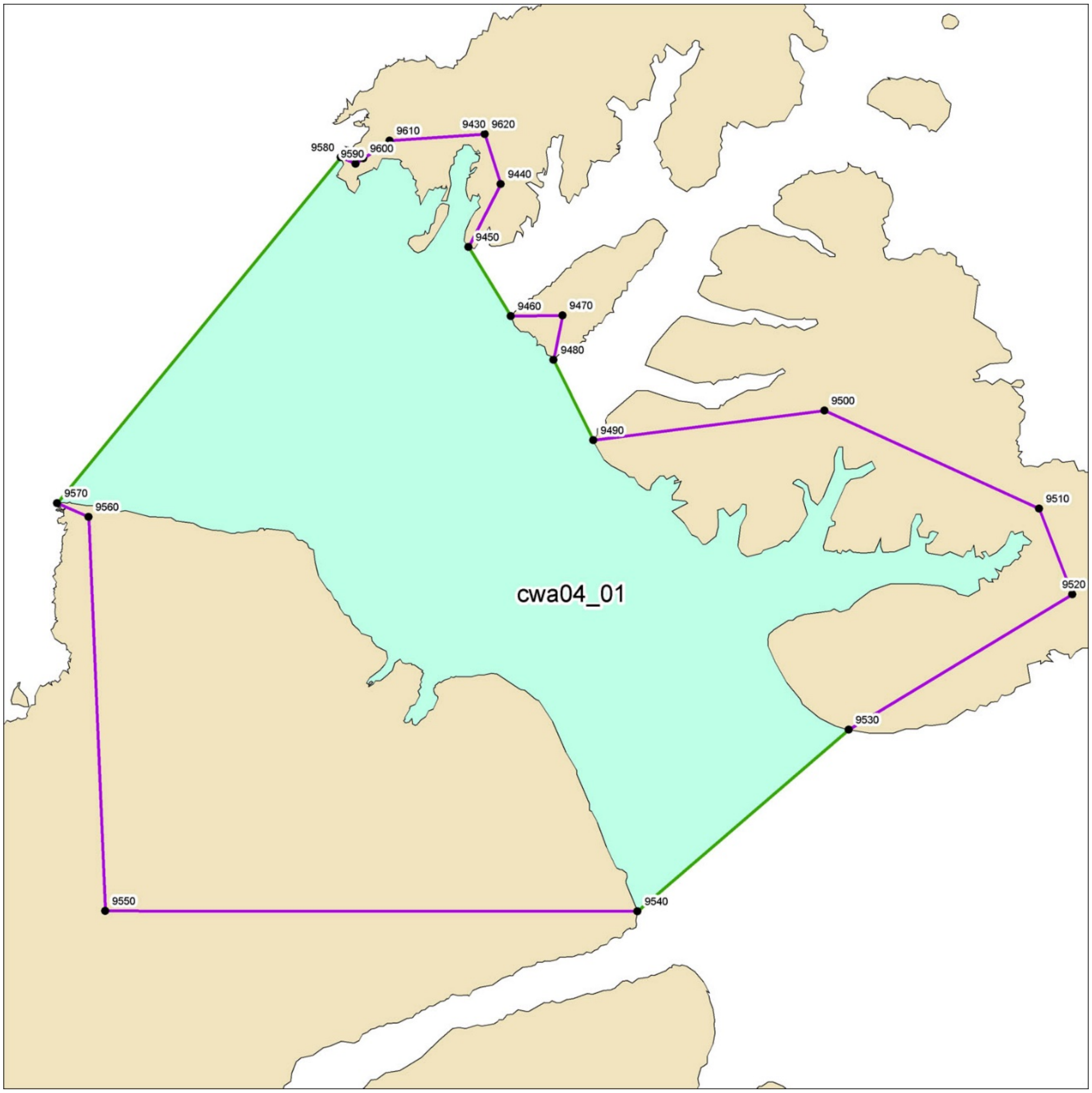

Figure 9: Illustration showing coordinates for Sub-region cwa04_01. Lines in green show shared boundaries and lines in purple indicate lines used for polygon completion. Land is depicted in tan.

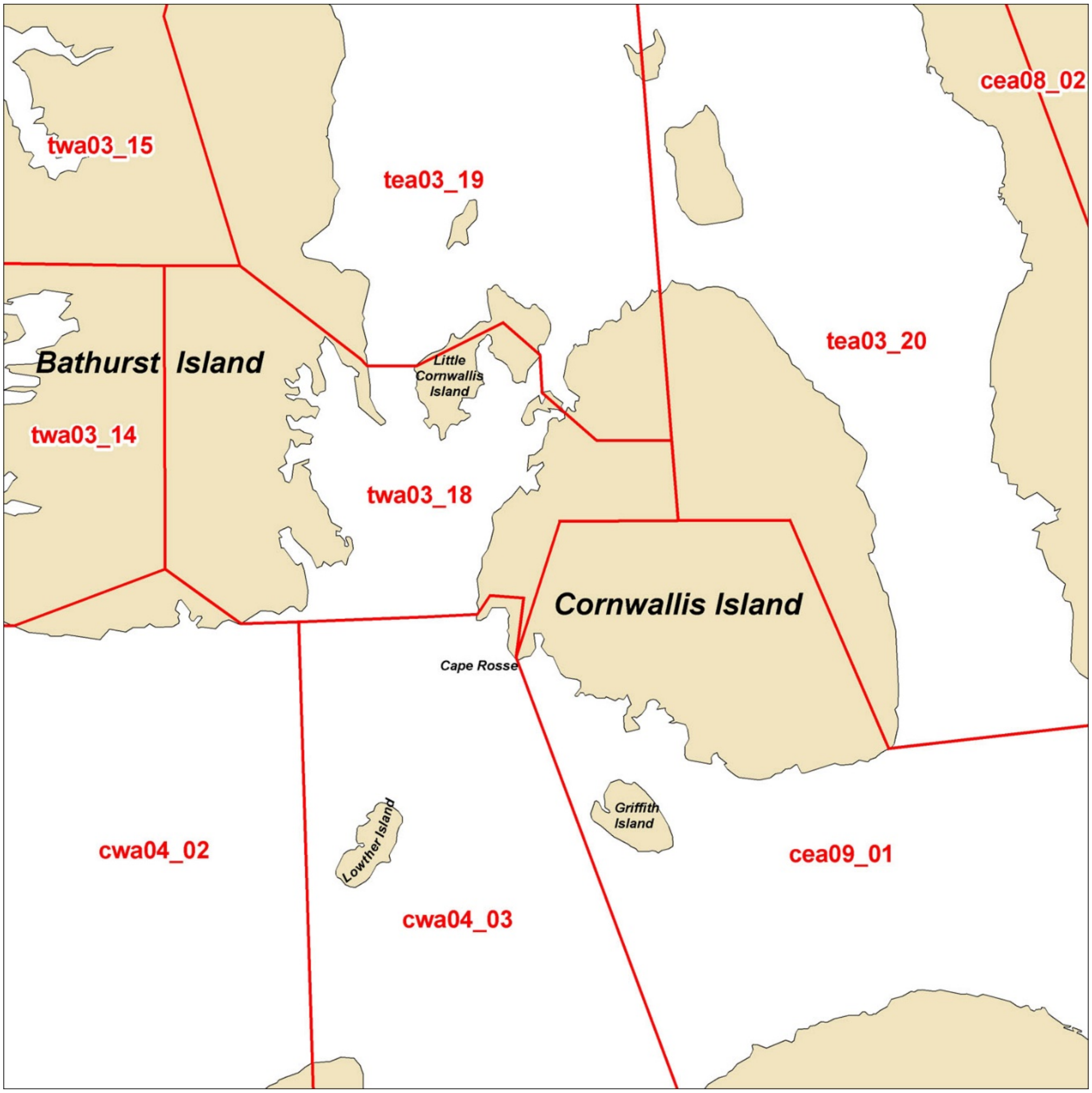

Figure 10: Detail of CISIRR Sub-region shapes around Cape Rosse on Cornwallis Island.

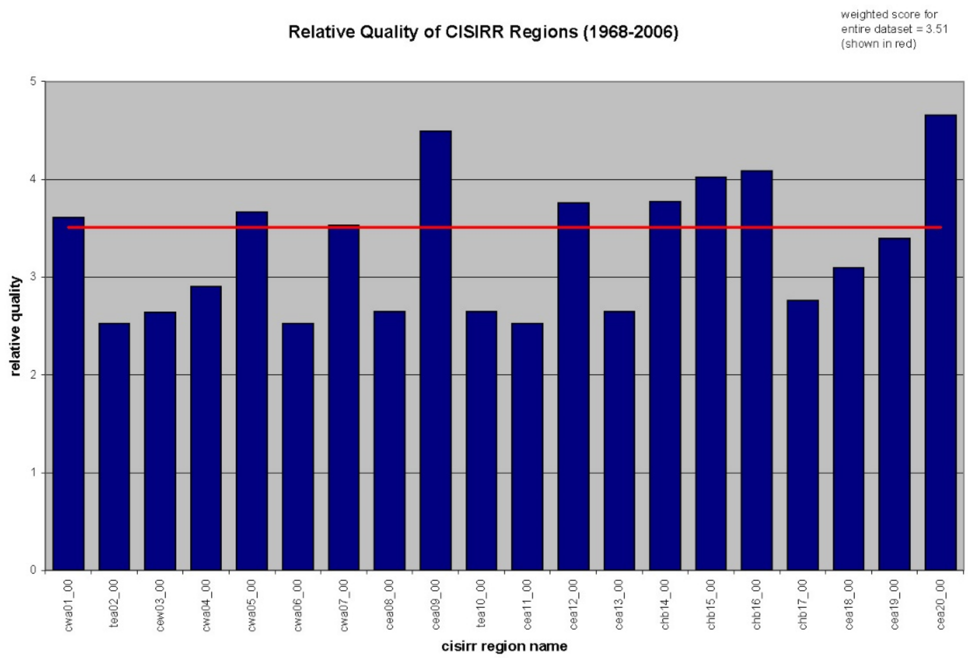

Figure 11: Overall QI scores for CISIRR Regions.

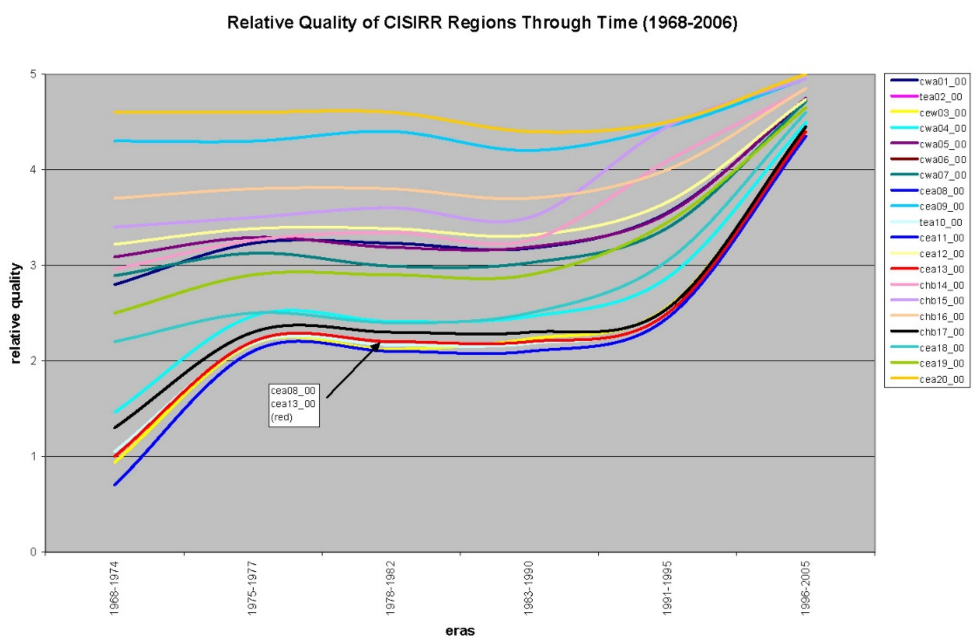

Figure 12: QI Scores for CISIRR Regions depicted through time.

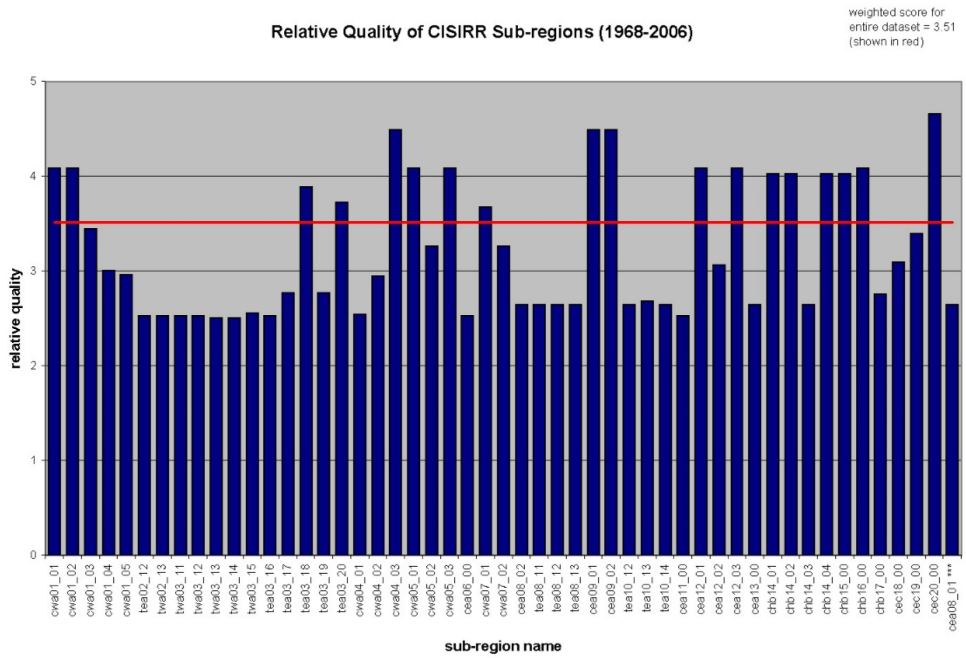

Figure 13: Overall QI scores for CISIRR Sub-regions.

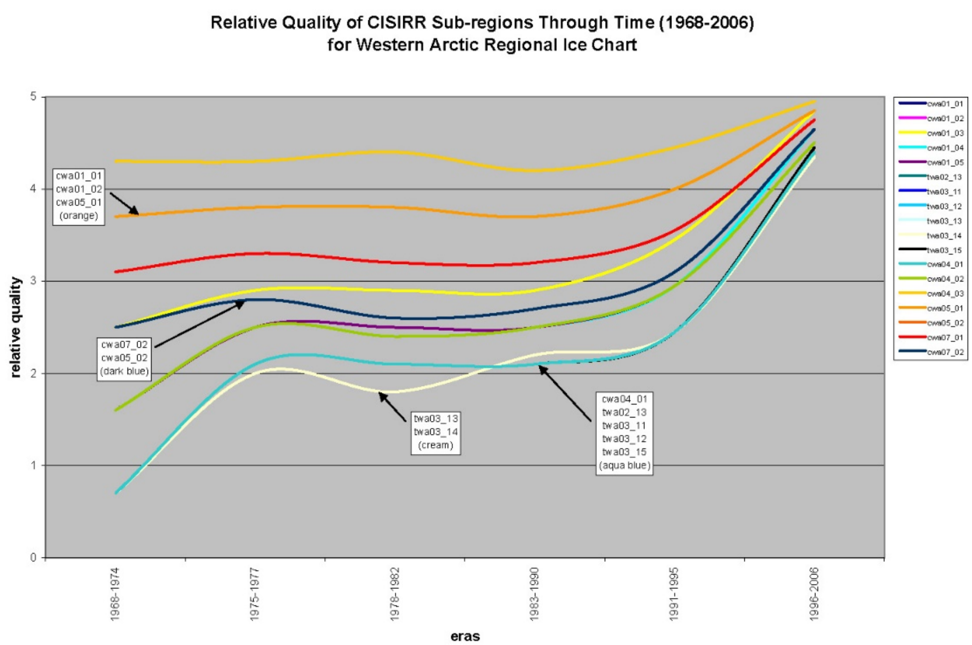

Figure 14: QI scores for CISIRR Sub-regions for the Western Arctic Regional Ice Chart.

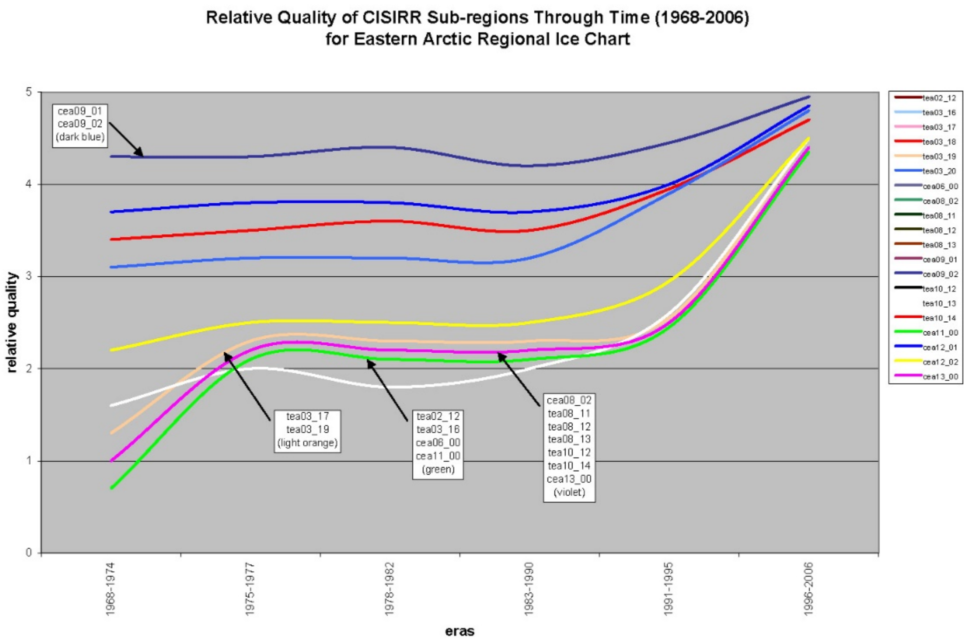

Figure 15: QI scores for CISIRR Sub-regions for the Eastern Arctic Regional Ice Chart.

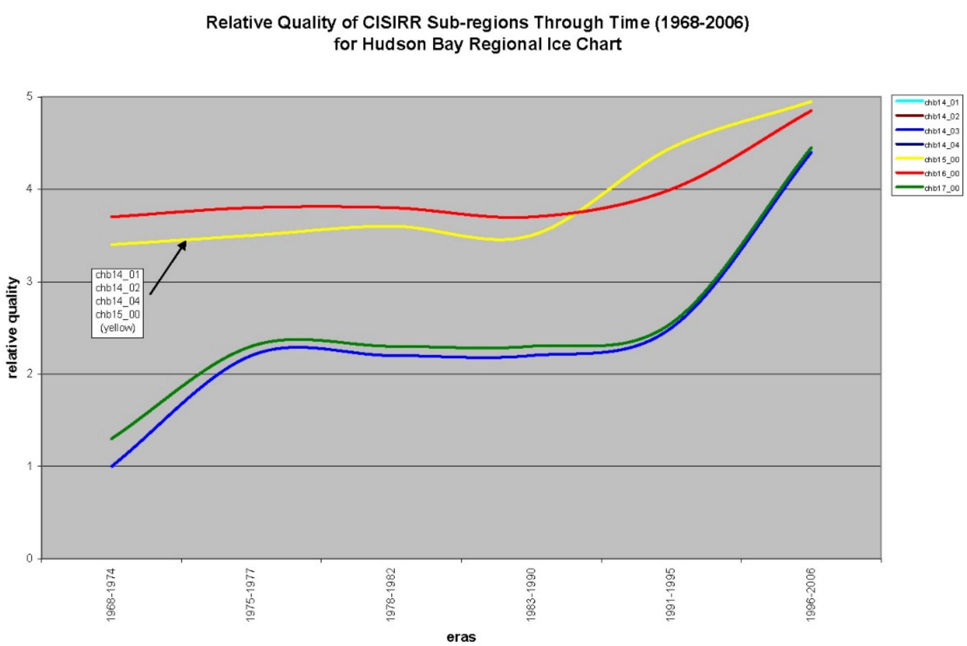

Figure 16: QI scores for CISIRR Sub-regions for the Hudson Bay Regional Ice Chart.

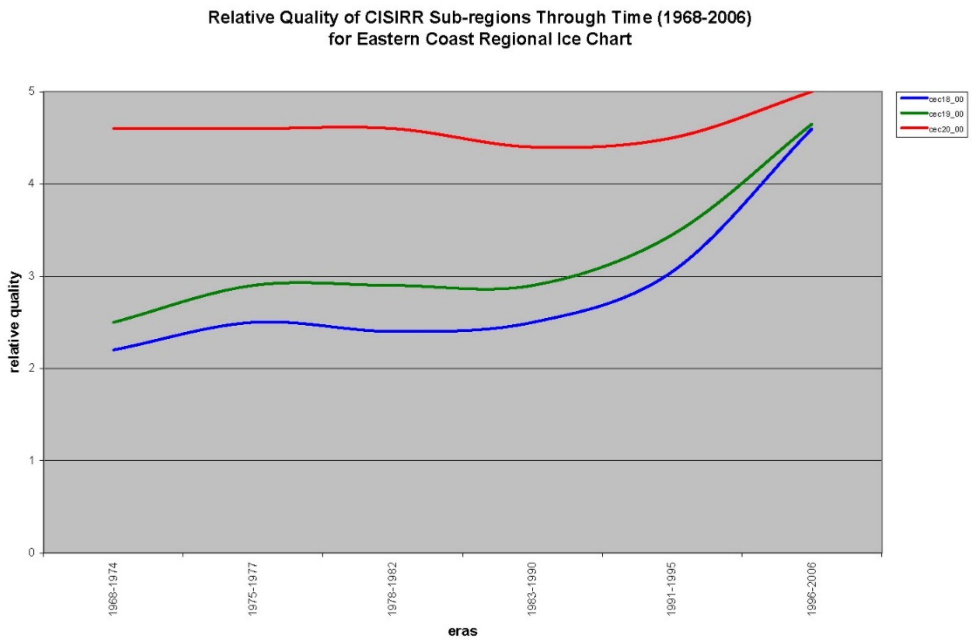

Figure 17: QI scores for CISIRR Sub-regions for the Eastern Coast Regional Ice Chart.

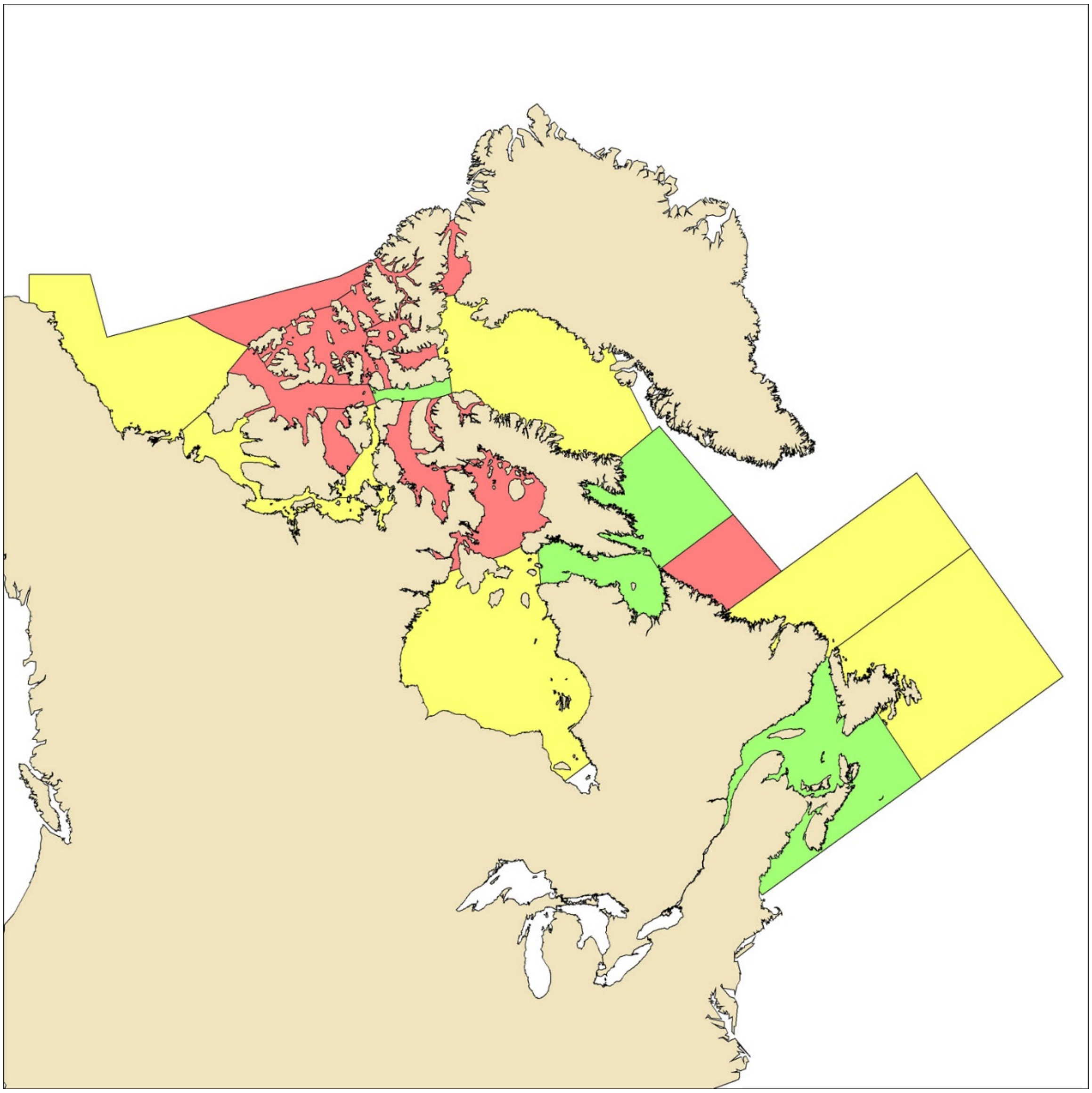

Figure 18: Map depicting QI scores for regions. Areas shown in red have overall QI scores under 3.00; areas shown in yellow have overall QI scores of 3.00 to 3.99; and areas shown in green have overall QI scores of 4.00 to 5.00.

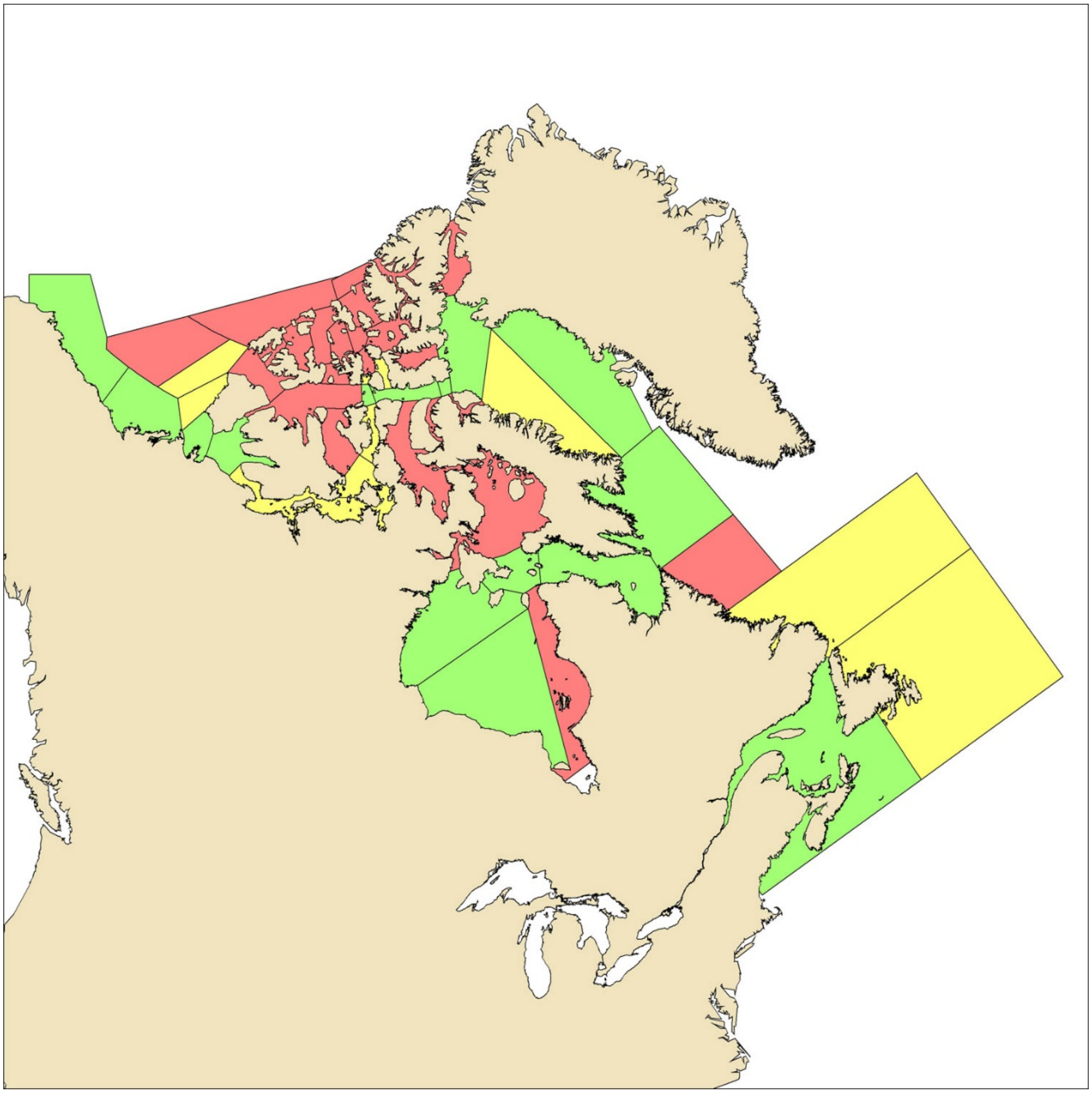

Figure 19: Map depicting QI scores for CISIRR Sub-regions. Areas shown in red have overall QI scores less than 3.00; areas shown in yellow have overall QI scores of 3.00 to 3.99; and areas shown in green have overall QI scores of 4.00 to 5.00.

6.0 Tables

Tables

Table 1: List of CISIRR Regions.

CISIRR Short Name	CISIRR Long Name	Points
cwa01_00	CIS WA Beaufort Sea	10 - 400
tew02_00	TEST EA-WA Arctic Ocean Periphery	410 - 840
cew03_00	CIS EA-WA Western High Arctic	850 - 1490
cwa04_00	CIS WA Western Parry Channel	1500 - 1990
cwa05_00	CIS WA Western Arctic Waterway	2000 - 2330
cwa06_00	CIS WA M'Clintock Channel	2340 - 2450
cwa07_00	CIS WA Franklin	2460 - 2800
cea08_00	CIS EA Eastern High Arctic	2810 - 3060
cea09_00	CIS EA Eastern Parry Channel	3070 - 3280
tea10_00	TEST EA Baffin Inlets	3290 - 3610
cea11_00	CIS EA Kane Basin	3620 - 3700
cea12_00	CIS EA Baffin Bay	3710 - 4030
cea13_00	CIS EA Foxe Basin	4040 - 4230
chb14_00	CIS HB Hudson Bay	4240 - 4530
chb15_00	CIS HB Hudson Strait	4540 - 4760
chb16_00	CIS HB Davis Strait	4770 - 4970
chb17_00	CIS HB Northern Labrador Sea	4980 - 5160
cec18_00	CIS EC Southern Labrador Sea	5170 - 5540
cec19_00	CIS EC Grand Banks	5550 - 5780
cec20_00	CIS EC Gulf of St. Lawrence	5790 - 6110

Table 2: List of CISIRR Sub-regions.

CISIRR Short Name	CISIRR Long Name	Points
cwa01_01	CIS WA Beaufort Sea: Alaska	6120 - 6250
cwa01_02	CIS WA Beaufort Sea: Mackenzie	6260 - 6460
cwa01_03	CIS WA Beaufort Sea: Banks	6470 - 6570
cwa01_04	CIS WA Beaufort Sea: Prince Alfred	6580 - 6720
cwa01_05	CIS WA Beaufort Sea: Canada Basin	6730 - 6970
tea02_12	TEST EA Arctic Ocean Periphery: East	6980 - 7070
twa02_13	TEST WA Arctic Ocean Periphery: West	7080 - 7460
twa03_11	TEST WA: Western High Arctic: Kellett – Crozier	7470 - 7600
twa03_12	TEST WA: Western High Arctic: Ballantyne – Hazen	7610 - 7820
twa03_13	TEST WA: Western High Arctic: Gustaf Adolf	7830 - 8030
twa03_14	TEST WA: Western High Arctic: Byam Martin	8040 - 8240
twa03_15	TEST WA: Western High Arctic: KCI West	8250 - 8480
tea03_16	TEST EA: Western High Arctic: Peary – Sverdrup	8490 - 8660
tea03_17	TEST EA: Western High Arctic: KCI East	8670 - 8880
twa03_18	TEST WA: Western High Arctic: McDougall	8890 - 9090
tea03_19	TEST EA: Western High Arctic: Penny	9100 - 9280
tea03_20	TEST EA: Western High Arctic: Wellington	9290 - 9420
cwa04_01	CIS WA Western Parry Channel: M'Clure	9430 - 9620
cwa04_02	CIS WA Western Parry Channel: Viscount Melville	9630 - 9930
cwa04_03	CIS WA Western Parry Channel: W Barrow	9940 - 10060
cwa05_01	CIS WA Western Arctic Waterway: Amundsen	10070 - 10170
cwa05_02	CIS WA Western Arctic Waterway: Coronation – Maud	10180 - 10410
cwa05_03	CIS WA Western Arctic Waterway: Amundsen Mouth	10420 - 10540
cwa07_01	CIS WA Franklin: Larsen – Victoria	10670 - 10860
cwa07_02	CIS WA Franklin: Peel Sound	10870 - 11040
cea08_01	CIS EA Eastern High Arctic: Eureka – Norwegian Bay	15230 - 15480
cea08_02	CIS EA Eastern High Arctic: Jones Sound	11050 - 11150
tea08_11	TEST EA Eastern High Arctic: Eureka	11160 - 11270
tea08_12	TEST EA Eastern High Arctic: Norwegian Bay	11280 - 11540
tea08_13	TEST EA Eastern High Arctic: Hell Gate	11550 - 11630
cea09_01	CIS EA Eastern Parry Channel: Lancaster – E Barrow	11640 - 11800
cea09_02	CIS EA Eastern Parry Channel: Lancaster Mouth	11810 - 11880
tea10_12	TEST EA Baffin Inlets: Prince Regent – Boothia	11890 - 12150
tea10_13	TEST EA Baffin Inlets: Admiralty	12160 - 12220
tea10_14	TEST EA Baffin Inlets: Pond Inlet	12230 - 12310
cea12_01	CIS EA Baffin Bay: E Baffin Bay	12410 - 12590
cea12_02	CIS EA Baffin Bay: W Baffin Bay	12600 - 12700
cea12_03	CIS EA Baffin Bay: NW Baffin Bay	12710 - 12850
chb14_01	CIS HB Hudson Bay: NW Hudson Bay	13060 - 13200
chb14_02	CIS HB Hudson Bay: Central Hudson Bay	13210 - 13330
chb14_03	CIS HB Hudson Bay: E Hudson Bay	13340 - 13510
chb14_04	CIS HB Hudson Bay: N Hudson Bay Narrows	13520 - 13640

Table 3: Example point coordinates for CISIRR Region cwa01_00.

CISIRR_ID	LATITUDE	LONGITUDE	RG_NAME	PNT_NAME	KNOWN_DMS
10	72.4794	-147.2406	cwa01_00	CIS common chart boundary	n/a
20	76.0000	-137.4117	cwa01_00	CIS common chart boundary	n/a
30	76.0000	-136.0000	cwa01_00		
40	76.0000	-135.0000	cwa01_00		
50	76.0000	-134.0000	cwa01_00		
60	76.0000	-133.0000	cwa01_00		
70	76.0000	-132.0000	cwa01_00		
80	76.0000	-131.0000	cwa01_00		
90	76.0000	-130.0000	cwa01_00		
100	76.0000	-129.0000	cwa01_00		
110	76.0000	-128.0000	cwa01_00		
120	76.0000	-127.0000	cwa01_00	Estimated	76 00 00 N,127 00 00 W
130	76.0000	-126.0000	cwa01_00		
140	76.0000	-125.0000	cwa01_00		
150	76.0000	-124.0000	cwa01_00		
160	76.0000	-123.0000	cwa01_00		
170	76.0000	-122.3742	cwa01_00		
180	75.9710	-122.4598	cwa01_00		
190	75.9746	-122.7133	cwa01_00	Unnamed point N of Perseverance Point	75 58 30 N,122 43 00 W
200	74.3413	-124.7759	cwa01_00	Cape Prince Alfred	74 20 00 N,124 46 00 W
210	74.3385	-124.2905	cwa01_00		
220	72.9400	-122.1492	cwa01_00		
230	72.0000	-125.7013	cwa01_00		
240	71.9560	-125.7938	cwa01_00		
250	71.9628	-125.9439	cwa01_00		
260	71.9673	-126.0000	cwa01_00	Cape Kellett	71 58 20 N,126 00 00 W
270	70.5669	-128.0000	cwa01_00	Cape Bathurst	70 34 00 N,128 00 00 W
280	70.5656	-127.9987	cwa01_00		
290	70.2045	-127.2075	cwa01_00		
300	69.1997	-126.5959	cwa01_00		
310	68.5500	-132.0000	cwa01_00		
320	68.5000	-137.0000	cwa01_00		
330	69.3211	-140.7362	cwa01_00		
340	69.6474	-141.0000	cwa01_00	Coast and border	69 37 00 N,141 00 00 W
350	69.0000	-142.0000	cwa01_00		
360	69.9693	-156.0236	cwa01_00		
370	70.5762	-160.1907	cwa01_00	CIS common chart boundary	n/a
380	71.4257	-164.0500	cwa01_00	CIS common chart boundary	n/a
390	74.0822	-157.7494	cwa01_00	CIS common chart boundary	n/a
400	72.4794	-147.2406	cwa01_00	CIS common chart boundary	n/a

Table 4: Example point coordinates for cwa01_04

POINT_ID	LATITUDE	LONGITUDE	RG_NAME	PNT_NAME	KNOWN_DMS
6580	76.0000	-127.0000	cwa01_04	Estimated	76 00 00 N,127 00 00 W
6590	76.0000	-126.0000	cwa01_04		
6600	76.0000	-125.0000	cwa01_04		
6610	76.0000	-124.0000	cwa01_04		
6620	76.0000	-123.0000	cwa01_04		
6630	76.0000	-122.3742	cwa01_04		
6640	75.9710	-122.4598	cwa01_04		
6650	75.9746	-122.7133	cwa01_04	Unnamed point N of Perseverance Point	75 58 30 N,122 43 00 W
6660	74.3413	-124.7759	cwa01_04	Cape Prince Alfred	74 20 00 N,124 46 00 W
6670	72.0000	-131.0000	cwa01_04	Estimated	72 00 00 N,131 00 00 W
6680	72.0000	-132.0000	cwa01_04		
6690	72.0000	-133.0000	cwa01_04		
6700	72.0000	-134.0000	cwa01_04		
6710	72.0000	-135.0000	cwa01_04	Estimated	72 00 00 N,135 00 00 W
6720	76.0000	-127.0000	cwa01_04	Estimated	76 00 00 N,127 00 00 W

Table 5: Overall QI scores for CISIRR Regions.

CISIRR Short Name	CISIRR Long Name	Overall Weighted Score (out of 5)
cwa01_00	CIS WA Beaufort Sea	3.61
tea02_00	TEST EA-WA Arctic Ocean Periphery	2.53
cew03_00	CIS EA-WA Western High Arctic	2.64
cwa04_00	CIS WA Western Parry Channel	2.90
cwa05_00	CIS WA Western Arctic Waterway	3.66
cwa06_00	CIS WA M'Clintock Channel	2.53
cwa07_00	CIS WA Franklin	3.53
cea08_00	CIS EA Eastern High Arctic	2.64
cea09_00	CIS EA Eastern Parry Channel	4.49
tea10_00	TEST EA Baffin Inlets	2.65
cea11_00	CIS EA Kane Basin	2.53
cea12_00	CIS EA Baffin Bay	3.76
cea13_00	CIS EA Foxe Basin	2.64
chb14_00	CIS HB Hudson Bay	3.77
chb15_00	CIS HB Hudson Strait	4.03
chb16_00	CIS HB Davis Strait	4.08
chb17_00	CIS HB Northern Labrador Sea	2.76
cea18_00	CIS EC Southern Labrador Sea	3.10
cea19_00	CIS EC Grand Banks	3.39
cea20_00	CIS EC Gulf of St. Lawrence	4.66

Table 6: QI scores through time for CISIRR regions.

CISIRR Short Name	1968-1974	1975-1977	1978-1982	1983-1990	1991-1995	1996-2006
cwa01_00	2.80	3.23	3.23	3.18	3.55	4.73
tea02_00	0.70	2.10	2.10	2.10	2.45	4.35
cew03_00	0.94	2.17	2.12	2.23	2.56	4.41
cwa04_00	1.46	2.47	2.41	2.46	2.87	4.49
cwa05_00	3.09	3.29	3.19	3.19	3.54	4.75
cwa06_00	0.70	2.10	2.10	2.10	2.45	4.35
cwa07_00	2.89	3.13	2.99	3.03	3.39	4.72
cea08_00	1.00	2.20	2.20	2.20	2.50	4.40
cea09_00	4.30	4.30	4.40	4.20	4.45	4.95
tea10_00	1.05	2.18	2.17	2.18	2.51	4.41
cea11_00	0.70	2.10	2.10	2.10	2.45	4.35
cea12_00	3.22	3.38	3.38	3.31	3.66	4.74
cea13_00	1.00	2.20	2.20	2.20	2.50	4.40
chb14_00	2.96	3.26	3.34	3.26	4.09	4.85
chb15_00	3.40	3.50	3.60	3.50	4.45	4.95
chb16_00	3.70	3.80	3.80	3.70	4.00	4.85
chb17_00	1.30	2.30	2.30	2.30	2.55	4.45
cea18_00	2.20	2.50	2.40	2.50	3.05	4.60
cea19_00	2.50	2.90	2.90	2.90	3.45	4.65
cea20_00	4.60	4.60	4.60	4.40	4.50	5.00

Table 7: Overall QI scores for CISIRR Sub-regions.

CISIRR Short Name	CISIRR Long Name	Overall Weighted Score (out of 5)
cwa01_01	CIS WA Beaufort Sea: Alaska	4.08
cwa01_02	CIS WA Beaufort Sea: Mackenzie	4.08
cwa01_03	CIS WA Beaufort Sea: Banks	3.45
cwa01_04	CIS WA Beaufort Sea: Prince Alfred	3.00
cwa01_05	CIS WA Beaufort Sea: Canada Basin	2.96
tea02_12	TEST EA Arctic Ocean Periphery: East	2.53
twa02_13	TEST WA Arctic Ocean Periphery: West	2.53
twa03_11	TEST WA: Western High Arctic: Kellett – Crozier	2.53
twa03_12	TEST WA: Western High Arctic: Ballantyne – Hazen	2.53
twa03_13	TEST WA: Western High Arctic: Gustaf Adolf	2.50
twa03_14	TEST WA: Western High Arctic: Byam Martin	2.50
twa03_15	TEST WA: Western High Arctic: KCI West	2.56
tea03_16	TEST EA: Western High Arctic: Peary – Sverdrup	2.53
tea03_17	TEST EA: Western High Arctic: KCI East	2.77
tea03_18	TEST WA: Western High Arctic: McDougall	3.89
tea03_19	TEST EA: Western High Arctic: Penny	2.77
tea03_20	TEST EA: Western High Arctic: Wellington	3.72
cwa04_01	CIS WA Western Parry Channel: M'Clure	2.54
cwa04_02	CIS WA Western Parry Channel: Viscount Melville	2.95
cwa04_03	CIS WA Western Parry Channel: W Barrow	4.49
cwa05_01	CIS WA Western Arctic Waterway: Amundsen	4.08
cwa05_02	CIS WA Western Arctic Waterway: Coronation – Maud	3.26
cwa05_03	CIS WA Western Arctic Waterway: Amundsen Mouth	4.08
cea06_00	CIS WA M'Clintock Channel	2.53
cwa07_01	CIS WA Franklin: Larsen – Victoria	3.67
cwa07_02	CIS WA Franklin: Peel Sound	3.26
cea08_02	CIS EA Eastern High Arctic: Jones Sound	2.64
tea08_11	TEST EA Eastern High Arctic: Eureka	2.64
tea08_12	TEST EA Eastern High Arctic: Norwegian Bay	2.64
tea08_13	TEST EA Eastern High Arctic: Hell Gate	2.64
cea09_01	CIS EA Eastern Parry Channel: Lancaster – E Barrow	4.49
cea09_02	CIS EA Eastern Parry Channel: Lancaster Mouth	4.49
tea10_12	TEST EA Baffin Inlets: Prince Regent – Boothia	2.64
tea10_13	TEST EA Baffin Inlets: Admiralty	2.68
tea10_14	TEST EA Baffin Inlets: Pond Inlet	2.64
cea11_00	CIS EA Kane Basin	2.53
cea12_01	CIS EA Baffin Bay: E Baffin Bay	4.08
cea12_02	CIS EA Baffin Bay: W Baffin Bay	3.07
cea12_03	CIS EA Baffin Bay: NW Baffin Bay	4.08
cea13_00	CIS EA Foxe Basin	2.64
chb14_01	CIS HB Hudson Bay: NW Hudson Bay	4.03
chb14_02	CIS HB Hudson Bay: Central Hudson Bay	4.03
chb14_03	CIS HB Hudson Bay: E Hudson Bay	2.64
chb14_04	CIS HB Hudson Bay: N Hudson Bay Narrows	4.03
chb15_00	CIS HB Hudson Strait	4.03
chb16_00	CIS HB Davis Strait	4.08
chb17_00	CIS HB Northern Labrador Sea	2.76
cec18_00	CIS EC Southern Labrador Sea	3.10
cec19_00	CIS EC Grand Banks	3.39
cec20_00	CIS EC Gulf of St. Lawrence	4.66
cea08_01 ***	CIS EA Eastern High Arctic: Eureka – Norwegian Bay	2.64

*** cea08_01 is composed of sub-regions tea08_11, tea08_12, and tea08_13

Table 8: QI scores through time for CISIRR Sub-regions.

CISIRR Short Name	1968-1974	1975-1977	1978-1982	1983-1990	1991-1995	1996-2006
cwa01_01	3.70	3.80	3.80	3.70	4.00	4.85
cwa01_02	3.70	3.80	3.80	3.70	4.00	4.85
cwa01_03	2.50	2.90	2.90	2.90	3.45	4.85
cwa01_04	1.60	2.50	2.50	2.50	2.95	4.65
cwa01_05	1.60	2.50	2.50	2.50	2.95	4.50
tea02_12	0.70	2.10	2.10	2.10	2.45	4.35
twa02_13	0.70	2.10	2.10	2.10	2.45	4.35
twa03_11	0.70	2.10	2.10	2.10	2.45	4.35
twa03_12	0.70	2.10	2.10	2.10	2.45	4.35
twa03_13	0.70	2.00	1.80	2.20	2.45	4.35
twa03_14	0.70	2.00	1.80	2.20	2.45	4.35
twa03_15	0.70	2.10	2.10	2.10	2.45	4.45
tea03_16	0.70	2.10	2.10	2.10	2.45	4.35
tea03_17	1.30	2.30	2.30	2.30	2.55	4.50
tea03_18	3.40	3.50	3.60	3.50	3.95	4.70
tea03_19	1.30	2.30	2.30	2.30	2.55	4.50
tea03_20	3.10	3.20	3.20	3.20	3.90	4.80
cwa04_01	0.70	2.10	2.10	2.10	2.45	4.40
cwa04_02	1.60	2.50	2.40	2.50	2.95	4.50
cwa04_03	4.30	4.30	4.40	4.20	4.45	4.95
cwa05_01	3.70	3.80	3.80	3.70	4.00	4.85
cwa05_02	2.50	2.80	2.60	2.70	3.10	4.65
cwa05_03	3.70	3.80	3.80	3.70	4.00	4.85
cea06_00	0.70	2.10	2.10	2.10	2.45	4.35
cwa07_01	3.10	3.30	3.20	3.20	3.55	4.75
cwa07_02	2.50	2.80	2.60	2.70	3.10	4.65
cea08_02	1.00	2.20	2.20	2.20	2.50	4.40
tea08_11	1.00	2.20	2.20	2.20	2.50	4.40
tea08_12	1.00	2.20	2.20	2.20	2.50	4.40
tea08_13	1.00	2.20	2.20	2.20	2.50	4.40
cea09_01	4.30	4.30	4.40	4.20	4.45	4.95
cea09_02	4.30	4.30	4.40	4.20	4.45	4.95
tea10_12	1.00	2.20	2.20	2.20	2.50	4.40
tea10_13	1.60	2.00	1.80	2.00	2.60	4.50
tea10_14	1.00	2.20	2.20	2.20	2.50	4.40
cea11_00	0.70	2.10	2.10	2.10	2.45	4.35
cea12_01	3.70	3.80	3.80	3.70	4.00	4.85
cea12_02	2.20	2.50	2.50	2.50	2.95	4.50
cea12_03	3.70	3.80	3.80	3.70	4.00	4.85
cea13_00	1.00	2.20	2.20	2.20	2.50	4.40
chb14_01	3.40	3.50	3.60	3.50	4.45	4.95
chb14_02	3.40	3.50	3.60	3.50	4.45	4.95
chb14_03	1.00	2.20	2.20	2.20	2.50	4.40
chb14_04	3.40	3.50	3.60	3.50	4.45	4.95
chb15_00	3.40	3.50	3.60	3.50	4.45	4.95
chb16_00	3.70	3.80	3.80	3.70	4.00	4.85
chb17_00	1.30	2.30	2.30	2.30	2.55	4.45
cec18_00	2.20	2.50	2.40	2.50	3.05	4.60
cec19_00	2.50	2.90	2.90	2.90	3.45	4.65
cec20_00	4.60	4.60	4.60	4.40	4.50	5.00
cea08_01 ***	1.00	2.20	2.20	2.20	2.50	4.40

*** cea08_01 is composed of sub-regions tea08_11, tea08_12, and tea08_13

Appendices

Appendix 1: Point coordinates for CISIRR Regions.

POINT_ID	LATITUDE	LONGITUDE	RG_NAME	PNT_NAME	KNOWN_DMS
10	72.4794	-147.2406	cwa01_00	CIS common chart boundary	n/a
20	76.0000	-137.4117	cwa01_00	CIS common chart boundary	n/a
30	76.0000	-136.0000	cwa01_00		
40	76.0000	-135.0000	cwa01_00		
50	76.0000	-134.0000	cwa01_00		
60	76.0000	-133.0000	cwa01_00		
70	76.0000	-132.0000	cwa01_00		
80	76.0000	-131.0000	cwa01_00		
90	76.0000	-130.0000	cwa01_00		
100	76.0000	-129.0000	cwa01_00		
110	76.0000	-128.0000	cwa01_00		
120	76.0000	-127.0000	cwa01_00	Estimated	76 00 00 N,127 00 00 W
130	76.0000	-126.0000	cwa01_00		
140	76.0000	-125.0000	cwa01_00		
150	76.0000	-124.0000	cwa01_00		
160	76.0000	-123.0000	cwa01_00		
170	76.0000	-122.3742	cwa01_00		
180	75.9710	-122.4598	cwa01_00		
190	75.9746	-122.7133	cwa01_00	Unnamed point N of Perseverance Point	75 58 30 N,122 43 00 W
200	74.3413	-124.7759	cwa01_00	Cape Prince Alfred	74 20 00 N,124 46 00 W
210	74.3385	-124.2905	cwa01_00		
220	72.9400	-122.1492	cwa01_00		
230	72.0000	-125.7013	cwa01_00		
240	71.9560	-125.7938	cwa01_00		
250	71.9628	-125.9439	cwa01_00		
260	71.9673	-126.0000	cwa01_00	Cape Kellett	71 58 20 N,126 00 00 W
270	70.5669	-128.0000	cwa01_00	Cape Bathurst	70 34 00 N,128 00 00 W
280	70.5656	-127.9987	cwa01_00		
290	70.2045	-127.2075	cwa01_00		
300	69.1997	-126.5959	cwa01_00		
310	68.5500	-132.0000	cwa01_00		
320	68.5000	-137.0000	cwa01_00		
330	69.3211	-140.7362	cwa01_00		
340	69.6474	-141.0000	cwa01_00	Coast and border	69 37 00 N,141 00 00 W
350	69.0000	-142.0000	cwa01_00		
360	69.9693	-156.0236	cwa01_00		
370	70.5762	-160.1907	cwa01_00	CIS common chart boundary	n/a
380	71.4257	-164.0500	cwa01_00	CIS common chart boundary	n/a
390	74.0822	-157.7494	cwa01_00	CIS common chart boundary	n/a
400	72.4794	-147.2406	cwa01_00	CIS common chart boundary	n/a
410	80.5893	-103.5425	tew02_00	CIS common chart boundary	n/a
420	81.3480	-93.1539	tew02_00	CIS common chart boundary (NE Axel Heiberg I.)	n/a
430	80.2500	-92.0000	tew02_00		
440	80.3078	-96.3984	tew02_00		
450	80.3486	-96.5798	tew02_00	Cape Northwest	80 21 00 N,96 36 00 W
460	80.1296	-99.1313	tew02_00	Unnamed NE corner of Meighen I.	80 07 00 N,99 07 00 W
470	79.8698	-100.0000	tew02_00	Where 100W hits SW Meighen I.	79 52 00 N,100 00 00 W
480	79.3681	-103.8930	tew02_00	EA 1997/98 chart boundary (NE Ellef Ringnes I.)	79 22 00 N,103 53 00 W
490	79.2652	-103.6864	tew02_00		

500	79.0317	-105.5758	tew02_00	SW corner of N. part of Isachsen Penin.	79 02 00 N,105 34 00 W
510	78.6925	-110.0000	tew02_00	Where 110W hits N Borden I.	78 40 00 N,110 00 00 W
520	78.5937	-110.6208	tew02_00		
530	78.4444	-112.4688	tew02_00		
540	78.2813	-113.0000	tew02_00	Where 113W hits SW Borden I.	78 18 00 N,113 00 00 W
550	78.0000	-114.1171	tew02_00	Where 78N meets E Brock I.	78 00 00 N,114 05 00 W
560	77.8333	-114.7513	tew02_00	Where 77 50 N hits W Brock I.	77 50 00 N,114 45 00 W
570	77.4950	-116.0534	tew02_00	Cape Krabbe	77 34 00 N,116 02 00 W
580	77.0832	-117.1608	tew02_00		
590	76.2414	-120.6769	tew02_00		
600	76.0989	-122.0788	tew02_00		
610	76.0000	-122.3742	tew02_00		
620	76.0000	-123.0000	tew02_00		
630	76.0000	-124.0000	tew02_00		
640	76.0000	-125.0000	tew02_00		
650	76.0000	-126.0000	tew02_00		
660	76.0000	-127.0000	tew02_00	Estimated	76 00 00 N,127 00 00 W
670	76.0000	-128.0000	tew02_00		
680	76.0000	-129.0000	tew02_00		
690	76.0000	-130.0000	tew02_00		
700	76.0000	-131.0000	tew02_00		
710	76.0000	-132.0000	tew02_00		
720	76.0000	-133.0000	tew02_00		
730	76.0000	-134.0000	tew02_00		
740	76.0000	-135.0000	tew02_00		
750	76.0000	-136.0000	tew02_00		
760	76.0000	-137.4117	tew02_00	CIS common chart boundary	n/a
770	76.3713	-136.0000	tew02_00	CIS common chart boundary	n/a
780	77.4981	-131.0000	tew02_00	CIS common chart boundary	n/a
790	78.3871	-126.0000	tew02_00	CIS common chart boundary	n/a
800	79.0938	-121.0000	tew02_00	CIS common chart boundary	n/a
810	79.6564	-116.0000	tew02_00	CIS common chart boundary	n/a
820	80.1020	-111.0000	tew02_00	CIS common chart boundary	n/a
830	80.4318	-106.2927	tew02_00	CIS common chart boundary	n/a
840	80.5893	-103.5425	tew02_00	CIS common chart boundary	n/a
850	80.2500	-92.0000	cew03_00		
860	79.3699	-89.4239	cew03_00		
870	78.1996	-92.0468	cew03_00	Cape Southwest	78 12 00 N,92 02 00 W
880	77.9500	-95.1167	cew03_00	Cape Ludwig	77 57 00 N,95 07 00 W
890	78.0000	-95.2000	cew03_00		
900	78.0000	-97.0000	cew03_00		
910	77.8003	-96.9154	cew03_00		
920	77.7915	-96.8202	cew03_00	Point on SW corner Amund Rignes I. facing Cornwall	77 48 00 N,96 50 00 W
930	77.6945	-96.2446	cew03_00	Small point closest to Amund Rignes I.	77 40 00 N,95 20 00 W
940	77.4789	-96.0000	cew03_00	Where 96W hits SE tip of Cornwall I.	77 41 00 N,96 14 00 W
950	76.9830	-96.7935	cew03_00	Unnamed point on Grinnell Penin.	76 59 00 N,96 47 00 W
960	76.4779	-94.1429	cew03_00		
970	76.3800	-93.7013	cew03_00		
980	76.3988	-92.2111	cew03_00		
990	75.2084	-91.0967	cew03_00		
1000	74.7114	-91.3904	cew03_00		
1010	74.6665	-91.6860	cew03_00	Unnamed point SW corner of Devon I.	73 39 00 N,91 40 00 W
1020	74.6670	-93.5388	cew03_00	Cape Dungeness	74 39 00 N,93 43 00 W

1030	75.1430	-94.1254	cew03_00		
1040	75.1614	-95.0000	cew03_00		
1050	75.1774	-95.9249	cew03_00		
1060	74.9098	-96.3309	cew03_00	Cape Rosse	75 54 00 N,96 19 00 W
1070	75.0277	-96.2456	cew03_00		
1080	75.0369	-96.5033	cew03_00		
1090	75.0000	-96.6119	cew03_00	Latitude 75N and coast	75 00 00 N,96 36 00 W
1100	75.0000	-97.0000	cew03_00		
1110	75.0000	-98.0000	cew03_00		
1120	75.0000	-98.4469	cew03_00	Latitude 75N and coast	75 00 00 N,98 30 00 W
1130	75.1123	-99.0301	cew03_00		
1140	75.0000	-100.2090	cew03_00	Cape Cockburn	75 02 00 N, 100 22 00
1150	75.0000	-101.0000	cew03_00		
1160	75.0000	-102.0000	cew03_00		
1170	75.0000	-103.0000	cew03_00		
1180	75.0000	-104.0000	cew03_00		
1190	75.0000	-105.0000	cew03_00		
1200	75.0000	-106.0000	cew03_00		
1210	75.0000	-106.5000	cew03_00		
1220	75.0000	-106.5150	cew03_00	Latitude 75N and coast	75 00 00 N,106 20 00 W
1230	75.1728	-107.1578	cew03_00		
1240	75.0675	-110.1506	cew03_00		
1250	75.3709	-110.8557	cew03_00		
1260	75.5775	-114.3624	cew03_00		
1270	75.2466	-117.6538	cew03_00	Cape Russell	75 14 00 N,117 39 00 W
1280	75.4996	-118.5756	cew03_00	Pedder Point	75 30 00 N,118 34 00 W
1290	75.6717	-118.6426	cew03_00		
1300	75.6106	-119.4035	cew03_00	Cape Nares	75 37 00 N,119 25 00 W
1310	75.8130	-120.3522	cew03_00	Cape Cam	75 49 00 N,120 16 00 W
1320	76.0800	-120.1818	cew03_00		
1330	76.2414	-120.6769	cew03_00		
1340	77.0832	-117.1608	cew03_00		
1350	77.4950	-116.0534	cew03_00	Cape Krabbe	77 34 00 N,116 02 00 W
1360	77.8333	-114.7513	cew03_00	Where 77 50 N hits W Brock I.	77 50 00 N,114 45 00 W
1370	78.0000	-114.1171	cew03_00	Where 78N meets E Brock I.	78 00 00 N,114 05 00 W
1380	78.2813	-113.0000	cew03_00	Where 113W hits SW Borden I.	78 18 00 N,113 00 00 W
1390	78.4444	-112.4688	cew03_00		
1400	78.5937	-110.6208	cew03_00		
1410	78.6925	-110.0000	cew03_00	Where 110W hits N Borden I.	78 40 00 N,110 00 00 W
1420	79.0317	-105.5758	cew03_00	SW corner of N. part of Isachsen Penin.	79 02 00 N,105 34 00 W
1430	79.2652	-103.6864	cew03_00		
1440	79.3681	-103.8930	cew03_00	EA 1997/98 chart boundary (NE Ellef Ringnes I.)	79 22 00 N,103 53 00 W
1450	79.8698	-100.0000	cew03_00	Where 100W hits SW Meighen I.	79 52 00 N,100 00 00 W
1460	80.1296	-99.1313	cew03_00	Unnamed NE corner of Meighen I.	80 07 00 N,99 07 00 W
1470	80.3486	-96.5798	cew03_00	Cape Northwest	80 21 00 N,96 36 00 W
1480	80.3078	-96.3984	cew03_00		
1490	80.2500	-92.0000	cew03_00		
1500	76.2414	-120.6769	cwa04_00		
1510	76.0800	-120.1818	cwa04_00		
1520	75.8130	-120.3522	cwa04_00	Cape Cam	75 49 00 N,120 16 00 W
1530	75.6106	-119.4035	cwa04_00	Cape Nares	75 37 00 N,119 25 00 W
1540	75.6717	-118.6426	cwa04_00		
1550	75.4996	-118.5756	cwa04_00	Pedder Point	75 30 00 N,118 34 00 W
1560	75.2466	-117.6538	cwa04_00	Cape Russell	75 14 00 N,117 39 00 W

1570	75.5775	-114.3624	cwa04_00		
1580	75.3709	-110.8557	cwa04_00		
1590	75.0675	-110.1506	cwa04_00		
1600	75.1728	-107.1578	cwa04_00		
1610	75.0000	-106.5150	cwa04_00	Latitude 75N and coast	75 00 00 N,106 20 00 W
1620	75.0000	-106.5000	cwa04_00		
1630	75.0000	-106.0000	cwa04_00		
1640	75.0000	-105.0000	cwa04_00		
1650	75.0000	-104.0000	cwa04_00		
1660	75.0000	-103.0000	cwa04_00		
1670	75.0000	-102.0000	cwa04_00		
1680	75.0000	-101.0000	cwa04_00		
1690	75.0000	-100.2090	cwa04_00	Cape Cockburn	75 02 00 N, 100 22 00
1700	75.1123	-99.0301	cwa04_00		
1710	75.0000	-98.4469	cwa04_00	Latitude 75N and coast	75 00 00 N,98 30 00 W
1720	75.0000	-98.0000	cwa04_00		
1730	75.0000	-97.0000	cwa04_00		
1740	75.0000	-96.6119	cwa04_00	Latitude 75N and coast	75 00 00 N,96 36 00 W
1750	75.0369	-96.5033	cwa04_00		
1760	75.0277	-96.2456	cwa04_00		
1770	74.9098	-96.3309	cwa04_00	Cape Rosse	75 54 00 N,96 19 00 W
1780	73.9878	-95.2970	cwa04_00	Pressure Point	73 59 00 N,95 18 00 W
1790	73.8510	-97.1783	cwa04_00	Lyons Point	73 51 00 N,97 11 00 W
1800	73.7672	-97.5441	cwa04_00		
1810	73.8357	-98.0000	cwa04_00		
1820	73.1274	-98.7224	cwa04_00		
1830	73.7009	-100.0558	cwa04_00		
1840	73.7321	-101.1139	cwa04_00	Cape Eden	73 47 00 N,101 02 00 W
1850	73.7117	-105.0000	cwa04_00	105W and coast (NE corner Stefanson I.)	73 26 00 N,105 00 00 W
1860	73.4649	-107.0000	cwa04_00	107W and coast (NW corner Stefanson I.)	73 28 00 N,107 00 00 W
1870	73.3005	-107.0000	cwa04_00	107W and coast (Storkerson Penin. Victoria I.)	73 18 00 N,107 00 00 W
1880	72.9994	-106.4744	cwa04_00		
1890	70.2031	-106.3783	cwa04_00		
1900	72.4717	-118.5272	cwa04_00	Hay Point	72 24 00 N,118 32 00 W
1910	72.4731	-119.2530	cwa04_00	Unnamed point across from Hay Point (E Banks	72 20 00 N,119 20 00 W
1920	72.9400	-122.1492	cwa04_00		
1930	74.3385	-124.2905	cwa04_00		
1940	74.3413	-124.7759	cwa04_00	Cape Prince Alfred	74 20 00 N,124 46 00 W
1950	75.9746	-122.7133	cwa04_00	Unnamed point N of Perseverance Point	75 58 30 N,122 43 00 W
1960	75.9710	-122.4598	cwa04_00		
1970	76.0000	-122.3742	cwa04_00		
1980	76.0989	-122.0788	cwa04_00		
1990	76.2414	-120.6769	cwa04_00		
2000	72.9400	-122.1492	cwa05_00		
2010	72.4731	-119.2530	cwa05_00	Unnamed point across from Hay Point (E Banks	72 20 00 N,119 20 00 W
2020	72.4717	-118.5272	cwa05_00	Hay Point	72 24 00 N,118 32 00 W
2030	70.2031	-106.3783	cwa05_00		
2040	69.0774	-103.2990	cwa05_00		
2050	69.0765	-102.2309	cwa05_00		
2060	69.0000	-101.8617	cwa05_00	Where 69N hits SE corner of Victoria I.	69 00 00 N,101 50 00 W
2070	69.0000	-100.6129	cwa05_00		
2080	69.0000	-100.3085	cwa05_00		

2090	69.0000	-100.2090	cwa05_00		
2100	69.0000	-99.9640	cwa05_00		
2110	69.0000	-99.5095	cwa05_00	Where 69N hits W coast of King William I.	69 00 00 N,99 30 00 W
2120	69.0283	-99.4205	cwa05_00		
2130	69.0999	-97.8814	cwa05_00		
2140	69.5578	-97.0000	cwa05_00	Where 97W hits E coast of King William I.	69 35 00 N,97 00 00 W
2150	69.6108	-94.9940	cwa05_00	Where 95W hits SW coast of Boothia Penin.	69 38 00 N,95 00 00 W
2160	69.8888	-94.5932	cwa05_00		
2170	69.6558	-93.2444	cwa05_00		
2180	69.3160	-93.0610	cwa05_00		
2190	67.8744	-93.4801	cwa05_00		
2200	66.4214	-95.9320	cwa05_00		
2210	66.2252	-108.8511	cwa05_00		
2220	67.7000	-117.0467	cwa05_00		
2230	69.2192	-118.6281	cwa05_00	Clifton Point	69 13 00 N,118 38 00 W
2240	69.2513	-123.2099	cwa05_00		
2250	69.1997	-126.5959	cwa05_00		
2260	70.2045	-127.2075	cwa05_00		
2270	70.5656	-127.9987	cwa05_00		
2280	70.5669	-128.0000	cwa05_00	Cape Bathurst	70 34 00 N,128 00 00 W
2290	71.9673	-126.0000	cwa05_00	Cape Kellett	71 58 20 N,126 00 00 W
2300	71.9628	-125.9439	cwa05_00		
2310	71.9560	-125.7938	cwa05_00		
2320	72.0000	-125.7013	cwa05_00		
2330	72.9400	-122.1492	cwa05_00		
2340	73.1274	-98.7224	cwa06_00		
2350	71.2938	-98.6836	cwa06_00	Cape Swinburne	71 17 00 N,98 41 00 W
2360	70.2063	-101.0000	cwa06_00	Cape Admiral Collinson	70 19 00 N,101 39 00 W
2370	70.0333	-101.2876	cwa06_00		
2380	70.2031	-106.3783	cwa06_00		
2390	72.9994	-106.4744	cwa06_00		
2400	73.3005	-107.0000	cwa06_00	107W and coast (Storkerson Penin. Victoria I.)	73 18 00 N,107 00 00 W
2410	73.4649	-107.0000	cwa06_00	107W and coast (NW corner Stefanson I.)	73 28 00 N,107 00 00 W
2420	73.7117	-105.0000	cwa06_00	105W and coast (NE corner Stefanson I.)	73 26 00 N,105 00 00 W
2430	73.7321	-101.1139	cwa06_00	Cape Eden	73 47 00 N,101 02 00 W
2440	73.7009	-100.0558	cwa06_00		
2450	73.1274	-98.7224	cwa06_00		
2460	73.9878	-95.2970	cwa07_00	Pressure Point	73 59 00 N,95 18 00 W
2470	73.8877	-94.9654	cwa07_00		
2480	73.6979	-94.1614	cwa07_00		
2490	73.4081	-94.5204	cwa07_00		
2500	72.2190	-94.7942	cwa07_00		
2510	71.9872	-95.0000	cwa07_00	Where 95W crosses Bellot Strait	n/a
2520	71.9769	-95.0000	cwa07_00	Where 95W crosses Bellot Strait	n/a
2530	71.8610	-95.0000	cwa07_00	Where 95W crosses Bellot Strait	n/a
2540	71.8552	-95.0000	cwa07_00	Where 95W crosses Bellot Strait	n/a
2550	71.6431	-94.9287	cwa07_00		
2560	71.1902	-95.3432	cwa07_00		
2570	70.8140	-96.5974	cwa07_00	Unnamed headland W coast of Boothia Penin.	70 50 00 N,96 40 00 W
2580	70.7392	-94.8720	cwa07_00		
2590	69.8888	-94.5932	cwa07_00		

2600	69.6108	-94.9940	cwa07_00	Where 95W hits SW coast of Boothia Penin.	69 38 00 N,95 00 00 W
2610	69.5578	-97.0000	cwa07_00	Where 97W hits E coast of King William I.	69 35 00 N,97 00 00 W
2620	69.0999	-97.8814	cwa07_00		
2630	69.0283	-99.4205	cwa07_00		
2640	69.0000	-99.5095	cwa07_00	Where 69N hits W coast of King William I.	69 00 00 N,99 30 00 W
2650	69.0000	-99.9640	cwa07_00		
2660	69.0000	-100.2090	cwa07_00		
2670	69.0000	-100.3085	cwa07_00		
2680	69.0000	-100.6129	cwa07_00		
2690	69.0000	-101.8617	cwa07_00	Where 69N hits SE corner of Victoria I.	69 00 00 N,101 50 00 W
2700	69.0765	-102.2309	cwa07_00		
2710	69.0774	-103.2990	cwa07_00		
2720	70.2031	-106.3783	cwa07_00		
2730	70.0333	-101.2876	cwa07_00		
2740	70.2063	-101.0000	cwa07_00	Cape Admiral Collinson	70 19 00 N,101 39 00 W
2750	71.2938	-98.6836	cwa07_00	Cape Swinburne	71 17 00 N,98 41 00 W
2760	73.1274	-98.7224	cwa07_00		
2770	73.8357	-98.0000	cwa07_00		
2780	73.7672	-97.5441	cwa07_00		
2790	73.8510	-97.1783	cwa07_00	Lyons Point	73 51 00 N,97 11 00 W
2800	73.9878	-95.2970	cwa07_00	Pressure Point	73 59 00 N,95 18 00 W
2810	81.3480	-93.1539	cea08_00	CIS common chart boundary (NE Axel Heiberg I.)	n/a
2820	81.4756	-90.6886	cea08_00	CIS common chart boundary (W Ellesmere I.)	n/a
2830	81.9336	-72.1873	cea08_00		
2840	78.8859	-80.2989	cea08_00		
2850	78.8509	-76.6345	cea08_00		
2860	77.0809	-83.8407	cea08_00		
2870	76.4005	-80.2683	cea08_00		
2880	76.1318	-81.0610	cea08_00	King Edward Point	76 07 55 N,81 03 00 W
2890	75.7743	-81.1455	cea08_00	Belcher Point	75 46 00 N,81 06 00 W
2900	75.0873	-82.8144	cea08_00		
2910	75.2084	-91.0967	cea08_00		
2920	76.3988	-92.2111	cea08_00		
2930	76.3800	-93.7013	cea08_00		
2940	76.4779	-94.1429	cea08_00		
2950	76.9830	-96.7935	cea08_00	Unnamed point on Grinnell Penin.	76 59 00 N,96 47 00 W
2960	77.4789	-96.0000	cea08_00	Where 96W hits SE tip of Cornwall I.	77 41 00 N,96 14 00 W
2970	77.6945	-96.2446	cea08_00	Small point closest to Amund Rignes I.	77 40 00 N,95 20 00 W
2980	77.7915	-96.8202	cea08_00	Point on SW corner Amund Rignes I. facing Cornwall	77 48 00 N,96 50 00 W
2990	77.8003	-96.9154	cea08_00		
3000	78.0000	-97.0000	cea08_00		
3010	78.0000	-95.2000	cea08_00		
3020	77.9500	-95.1167	cea08_00	Cape Ludwig	77 57 00 N,95 07 00 W
3030	78.1996	-92.0468	cea08_00	Cape Southwest	78 12 00 N,92 02 00 W
3040	79.3699	-89.4239	cea08_00		
3050	80.2500	-92.0000	cea08_00		
3060	81.3480	-93.1539	cea08_00	CIS common chart boundary (NE Axel Heiberg I.)	n/a
3070	75.0873	-82.8144	cea09_00		
3080	74.5807	-80.2282	cea09_00	Cape Sherard	74 36 00 N,80 13 00 W

3090	73.7541	-80.8409	cea09_00	Unnamed cape NE tip of Bylot I.	73 44 00 N,80 40 00 W
3100	73.7336	-81.6004	cea09_00	Unnamed point of land NE tip of Borden Penin.	73 44 00 N,81 40 00 W
3110	73.6990	-81.6190	cea09_00		
3120	73.7179	-82.8210	cea09_00		
3130	73.7385	-82.8539	cea09_00	Cape Charles Yorke	73 44 00 N,82 49 00 W
3140	73.7318	-86.3250	cea09_00		
3150	73.8164	-87.0011	cea09_00	Cape York	73 48 00 N,87 00 00 W
3160	73.9058	-90.1608	cea09_00	Cape Clarence	73 54 00 N,90 10 00 W
3170	73.8826	-90.4460	cea09_00		
3180	73.8877	-94.9654	cea09_00		
3190	73.9878	-95.2970	cea09_00	Pressure Point	73 59 00 N,95 18 00 W
3200	74.9098	-96.3309	cea09_00	Cape Rosse	75 54 00 N,96 19 00 W
3210	75.1774	-95.9249	cea09_00		
3220	75.1614	-95.0000	cea09_00		
3230	75.1430	-94.1254	cea09_00		
3240	74.6670	-93.5388	cea09_00	Cape Dungeness	74 39 00 N,93 43 00 W
3250	74.6665	-91.6860	cea09_00	Unnamed point SW corner of Devon I.	73 39 00 N,91 40 00 W
3260	74.7114	-91.3904	cea09_00		
3270	75.2084	-91.0967	cea09_00		
3280	75.0873	-82.8144	cea09_00		
3290	73.7541	-80.8409	tea10_00	Unnamed cape NE tip of Bylot I.	73 44 00 N,80 40 00 W
3300	72.8629	-76.0615	tea10_00	Cape Graham Moore	72 52 00 N,76 04 00 W
3310	72.5873	-75.8059	tea10_00	Cape Weld	72 35 00 N,75 46 00 W
3320	71.3328	-77.2790	tea10_00		
3330	71.1128	-82.3143	tea10_00		
3340	70.3463	-83.1239	tea10_00		
3350	69.8602	-82.4474	tea10_00		
3360	69.6995	-82.5441	tea10_00		
3370	69.6949	-82.5869	tea10_00		
3380	69.6630	-82.5548	tea10_00		
3390	69.5490	-84.0098	tea10_00		
3400	67.5913	-84.0008	tea10_00		
3410	66.2368	-89.7788	tea10_00		
3420	68.0040	-91.3128	tea10_00		
3430	70.7977	-94.2929	tea10_00		
3440	71.8395	-94.9945	tea10_00		
3450	71.8552	-95.0000	tea10_00	Where 95W crosses Bellot Strait	n/a
3460	71.8610	-95.0000	tea10_00	Where 95W crosses Bellot Strait	n/a
3470	71.9769	-95.0000	tea10_00	Where 95W crosses Bellot Strait	n/a
3480	71.9872	-95.0000	tea10_00	Where 95W crosses Bellot Strait	n/a
3490	72.2190	-94.7942	tea10_00		
3500	73.4081	-94.5204	tea10_00		
3510	73.6979	-94.1614	tea10_00		
3520	73.8877	-94.9654	tea10_00		
3530	73.8826	-90.4460	tea10_00		
3540	73.9058	-90.1608	tea10_00	Cape Clarence	73 54 00 N,90 10 00 W
3550	73.8164	-87.0011	tea10_00	Cape York	73 48 00 N,87 00 00 W
3560	73.7318	-86.3250	tea10_00		
3570	73.7385	-82.8539	tea10_00	Cape Charles Yorke	73 44 00 N,82 49 00 W
3580	73.7179	-82.8210	tea10_00		
3590	73.6990	-81.6190	tea10_00		
3600	73.7336	-81.6004	tea10_00	Unnamed point of land NE tip of Borden Penin.	73 44 00 N,81 40 00 W
3610	73.7541	-80.8409	tea10_00	Unnamed cape NE tip of Bylot I.	73 44 00 N,80 40 00 W
3620	81.9336	-72.1873	cea11_00		
3630	81.2708	-46.1272	cea11_00		

3640	77.4053	-60.6687	cea11_00		
3650	78.5143	-72.4951	cea11_00		
3660	78.5110	-72.5952	cea11_00	Unnamed point across from Cape Herschel	78 30 00 N,72 45 00 W
3670	78.5863	-74.5952	cea11_00	Cape Herschel	78 35 00 N,74 35 00 W
3680	78.8509	-76.6345	cea11_00		
3690	78.8859	-80.2989	cea11_00		
3700	81.9336	-72.1873	cea11_00		
3710	77.4053	-60.6687	cea12_00		
3720	71.6262	-52.1573	cea12_00		
3730	71.5636	-52.2150	cea12_00		
3740	71.3935	-52.3701	cea12_00	CIS common chart boundary	n/a
3750	71.2200	-52.5253	cea12_00		
3760	71.1852	-52.5561	cea12_00		
3770	70.7489	-52.9331	cea12_00		
3780	70.3663	-53.2502	cea12_00		
3790	70.2062	-53.3793	cea12_00		
3800	69.5083	-53.9194	cea12_00		
3810	69.4396	-53.9706	cea12_00		
3820	69.3254	-54.0550	cea12_00		
3830	66.7026	-55.7734	cea12_00	CIS common chart boundary	n/a
3840	66.6165	-61.2577	cea12_00	Cape Dyer	66 37 00 N,61 16 00 W
3850	66.6206	-61.2924	cea12_00		
3860	66.7252	-62.1870	cea12_00		
3870	66.5067	-62.8407	cea12_00		
3880	67.0682	-68.3554	cea12_00		
3890	71.3328	-77.2790	cea12_00		
3900	72.5873	-75.8059	cea12_00	Cape Weld	72 35 00 N,75 46 00 W
3910	72.8629	-76.0615	cea12_00	Cape Graham Moore	72 52 00 N,76 04 00 W
3920	73.7541	-80.8409	cea12_00	Unnamed cape NE tip of Bylot I.	73 44 00 N,80 40 00 W
3930	74.5807	-80.2282	cea12_00	Cape Sherard	74 36 00 N,80 13 00 W
3940	75.0873	-82.8144	cea12_00		
3950	75.7743	-81.1455	cea12_00	Belcher Point	75 46 00 N,81 06 00 W
3960	76.1318	-81.0610	cea12_00	King Edward Point	76 07 55 N,81 03 00 W
3970	76.4005	-80.2683	cea12_00		
3980	77.0809	-83.8407	cea12_00		
3990	78.8509	-76.6345	cea12_00		
4000	78.5863	-74.5952	cea12_00	Cape Herschel	78 35 00 N,74 35 00 W
4010	78.5110	-72.5952	cea12_00	Unnamed point across from Cape Herschel	78 30 00 N,72 45 00 W
4020	78.5143	-72.4951	cea12_00		
4030	77.4053	-60.6687	cea12_00		
4040	71.3328	-77.2790	cea13_00		
4050	67.0682	-68.3554	cea13_00		
4060	65.0169	-71.3028	cea13_00		
4070	64.9197	-75.9634	cea13_00		
4080	64.8371	-77.8828	cea13_00		
4090	64.8276	-78.0708	cea13_00		
4100	64.6824	-80.5172	cea13_00		
4110	64.6615	-83.7054	cea13_00		
4120	64.5014	-88.4763	cea13_00		
4130	64.6620	-88.5895	cea13_00		
4140	66.2368	-89.7788	cea13_00		
4150	67.5913	-84.0008	cea13_00		
4160	69.5490	-84.0098	cea13_00		
4170	69.6630	-82.5548	cea13_00		
4180	69.6949	-82.5869	cea13_00		

4190	69.6995	-82.5441	cea13_00		
4200	69.8602	-82.4474	cea13_00		
4210	70.3463	-83.1239	cea13_00		
4220	71.1128	-82.3143	cea13_00		
4230	71.3328	-77.2790	cea13_00		
4240	64.9197	-75.9634	chb14_00		
4250	62.5806	-77.5097	chb14_00	Wolstanholme	62 34 50 N,77 30 35 W
4260	60.6337	-76.3923	chb14_00		
4270	56.5269	-74.4089	chb14_00		
4280	55.9040	-75.2245	chb14_00		
4290	54.1145	-77.3863	chb14_00		
4300	54.1142	-77.3863	chb14_00		
4310	53.0518	-77.1001	chb14_00		
4320	52.7323	-78.8455	chb14_00		
4330	52.1899	-81.4543	chb14_00		
4340	51.8852	-82.7713	chb14_00		
4350	52.9218	-84.0469	chb14_00		
4360	53.3903	-84.6789	chb14_00		
4370	54.2276	-85.8601	chb14_00		
4380	54.3938	-86.1028	chb14_00		
4390	55.2979	-89.3532	chb14_00		
4400	55.2632	-91.0046	chb14_00		
4410	56.9384	-92.6842	chb14_00		
4420	56.9641	-92.7114	chb14_00		
4430	58.4346	-94.3476	chb14_00		
4440	61.6105	-98.5101	chb14_00		
4450	63.7217	-92.1511	chb14_00		
4460	63.7645	-92.0015	chb14_00		
4470	64.6620	-88.5895	chb14_00		
4480	64.5014	-88.4763	chb14_00		
4490	64.6615	-83.7054	chb14_00		
4500	64.6824	-80.5172	chb14_00		
4510	64.8276	-78.0708	chb14_00		
4520	64.8371	-77.8828	chb14_00		
4530	64.9197	-75.9634	chb14_00		
4540	65.0169	-71.3028	chb15_00		
4550	63.7896	-71.3845	chb15_00		
4560	62.1884	-66.2149	chb15_00		
4570	62.1133	-66.0802	chb15_00		
4580	62.0549	-66.0170	chb15_00		
4590	61.6764	-65.1013	chb15_00		
4600	61.4532	-64.8621	chb15_00		
4610	61.3728	-64.8847	chb15_00		
4620	61.3185	-64.8412	chb15_00		
4630	61.3155	-64.8506	chb15_00	SE tip of Resolution I.	n/a
4640	60.6070	-64.8668	chb15_00		
4650	60.4879	-64.6580	chb15_00	Cape Chidley	60 23 00 N,64 26 00 W
4660	60.3014	-64.6450	chb15_00		
4670	60.2640	-64.7958	chb15_00		
4680	60.0317	-64.8050	chb15_00		
4690	56.5551	-64.7611	chb15_00		
4700	56.2792	-69.2756	chb15_00		
4710	58.0016	-71.0188	chb15_00		
4720	60.1580	-74.0509	chb15_00		
4730	60.6337	-76.3923	chb15_00		
4740	62.5806	-77.5097	chb15_00	Wolstanholme	62 34 50 N,77 30 35 W
4750	64.9197	-75.9634	chb15_00		

4760	65.0169	-71.3028	chb15_00		
4770	66.7026	-55.7734	chb16_00	CIS common chart boundary	n/a
4780	66.6965	-54.5786	chb16_00		
4790	60.5211	-54.7781	chb16_00		
4800	60.4879	-64.6580	chb16_00	Cape Chidley	60 23 00 N,64 26 00 W
4810	60.6070	-64.8668	chb16_00		
4820	61.3155	-64.8506	chb16_00	SE tip of Resolution I.	n/a
4830	61.3185	-64.8412	chb16_00		
4840	61.3728	-64.8847	chb16_00		
4850	61.4532	-64.8621	chb16_00		
4860	61.6764	-65.1013	chb16_00		
4870	62.0549	-66.0170	chb16_00		
4880	62.1133	-66.0802	chb16_00		
4890	62.1884	-66.2149	chb16_00		
4900	63.7896	-71.3845	chb16_00		
4910	65.0169	-71.3028	chb16_00		
4920	67.0682	-68.3554	chb16_00		
4930	66.5067	-62.8407	chb16_00		
4940	66.7252	-62.1870	chb16_00		
4950	66.6206	-61.2924	chb16_00		
4960	66.6165	-61.2577	chb16_00	Cape Dyer	66 37 00 N,61 16 00 W
4970	66.7026	-55.7734	chb16_00	CIS common chart boundary	n/a
4980	60.5211	-54.7781	chb17_00		
4990	56.5362	-54.8702	chb17_00		
5000	56.6512	-59.5886	chb17_00		
5010	56.6520	-60.0406	chb17_00		
5020	56.6505	-60.6277	chb17_00		
5030	56.6473	-61.0810	chb17_00		
5040	56.6460	-61.2185	chb17_00		
5050	56.6452	-61.2939	chb17_00		
5060	56.6440	-61.3958	chb17_00		
5070	56.6428	-61.4952	chb17_00		
5080	56.6406	-61.6579	chb17_00		
5090	56.6369	-61.9012	chb17_00		
5100	56.6341	-62.0698	chb17_00		
5110	56.5551	-64.7611	chb17_00		
5120	60.0317	-64.8050	chb17_00		
5130	60.2640	-64.7958	chb17_00		
5140	60.3014	-64.6450	chb17_00		
5150	60.4879	-64.6580	chb17_00	Cape Chidley	60 23 00 N,64 26 00 W
5160	60.5211	-54.7781	chb17_00		
5170	54.7302	-39.4138	cec18_00		
5180	50.0773	-41.8467	cec18_00		
5190	50.8541	-46.8789	cec18_00		
5200	50.9829	-47.9423	cec18_00		
5210	51.1004	-49.0123	cec18_00		
5220	51.2065	-50.0882	cec18_00		
5230	51.3012	-51.1696	cec18_00		
5240	51.3844	-52.2558	cec18_00		
5250	51.4559	-53.3462	cec18_00		
5260	51.5157	-54.4403	cec18_00		
5270	51.5637	-55.5373	cec18_00		
5280	51.4346	-55.6027	cec18_00		
5290	51.4331	-55.9634	cec18_00		
5300	51.4030	-56.3247	cec18_00		
5310	51.3732	-56.4287	cec18_00		
5320	51.3744	-56.4280	cec18_00		

5330	51.8809	-57.2588	cec18_00		
5340	51.7688	-58.2836	cec18_00		
5350	51.6465	-59.3024	cec18_00		
5360	51.5142	-60.3147	cec18_00		
5370	52.3617	-60.9759	cec18_00		
5380	53.2069	-61.6664	cec18_00		
5390	54.0494	-62.3882	cec18_00		
5400	54.8886	-63.1431	cec18_00		
5410	56.5551	-64.7611	cec18_00		
5420	56.6341	-62.0698	cec18_00		
5430	56.6369	-61.9012	cec18_00		
5440	56.6406	-61.6579	cec18_00		
5450	56.6428	-61.4952	cec18_00		
5460	56.6440	-61.3958	cec18_00		
5470	56.6452	-61.2939	cec18_00		
5480	56.6460	-61.2185	cec18_00		
5490	56.6473	-61.0810	cec18_00		
5500	56.6505	-60.6277	cec18_00		
5510	56.6520	-60.0406	cec18_00		
5520	56.6512	-59.5886	cec18_00		
5530	56.5362	-54.8702	cec18_00		
5540	54.7302	-39.4138	cec18_00		
5550	50.0773	-41.8467	cec19_00		
5560	42.2157	-44.9298	cec19_00		
5570	43.4922	-56.9313	cec19_00		
5580	44.5177	-56.8002	cec19_00		
5590	45.5480	-56.6632	cec19_00		
5600	46.5828	-56.5196	cec19_00		
5610	47.6220	-56.3690	cec19_00		
5620	47.6398	-56.4348	cec19_00		
5630	48.7334	-56.8443	cec19_00		
5640	49.8297	-57.2757	cec19_00		
5650	51.3732	-56.4287	cec19_00		
5660	51.4030	-56.3247	cec19_00		
5670	51.4331	-55.9634	cec19_00		
5680	51.4346	-55.6027	cec19_00		
5690	51.5637	-55.5373	cec19_00		
5700	51.5157	-54.4403	cec19_00		
5710	51.4559	-53.3462	cec19_00		
5720	51.3844	-52.2558	cec19_00		
5730	51.3012	-51.1696	cec19_00		
5740	51.2065	-50.0882	cec19_00		
5750	51.1004	-49.0123	cec19_00		
5760	50.9829	-47.9423	cec19_00		
5770	50.8541	-46.8789	cec19_00		
5780	50.0773	-41.8467	cec19_00		
5790	51.3732	-56.4287	cec20_00		
5800	49.8297	-57.2757	cec20_00		
5810	48.7334	-56.8443	cec20_00		
5820	47.6398	-56.4348	cec20_00		
5830	47.6220	-56.3690	cec20_00		
5840	46.5828	-56.5196	cec20_00		
5850	45.5480	-56.6632	cec20_00		
5860	44.5177	-56.8002	cec20_00		
5870	43.4922	-56.9313	cec20_00		
5880	42.9031	-70.5969	cec20_00		
5890	43.1571	-70.6656	cec20_00		

5900	43.2549	-70.6922	cec20_00		
5910	45.5887	-71.2578	cec20_00		
5920	46.6734	-71.5341	cec20_00		
5930	46.7091	-71.5435	cec20_00		
5940	49.0847	-72.1963	cec20_00		
5950	49.3348	-71.2790	cec20_00		
5960	49.5808	-70.3334	cec20_00		
5970	49.8178	-69.3766	cec20_00		
5980	50.0455	-68.4090	cec20_00		
5990	50.2638	-67.4308	cec20_00		
6000	50.4725	-66.4422	cec20_00		
6010	50.6715	-65.4438	cec20_00		
6020	50.8605	-64.4356	cec20_00		
6030	51.0395	-63.4182	cec20_00		
6040	51.2082	-62.3920	cec20_00		
6050	51.3664	-61.3573	cec20_00		
6060	51.5142	-60.3147	cec20_00		
6070	51.6465	-59.3024	cec20_00		
6080	51.7688	-58.2836	cec20_00		
6090	51.8809	-57.2588	cec20_00		
6100	51.3744	-56.4280	cec20_00		
6110	51.3732	-56.4287	cec20_00		

Appendix 2: Point coordinates for CISIRR Sub-regions.

POINT_ID	LATITUDE	LONGITUDE	RG_NAME	PNT_NAME	KNOWN_DMS
6120	72.4794	-147.2406	cwa01_01	CIS common chart boundary	n/a
6130	72.0000	-146.0000	cwa01_01	Estimated	72 00 00 N,146 00 00 W
6140	72.0000	-145.0000	cwa01_01		
6150	72.0000	-144.0000	cwa01_01		
6160	72.0000	-143.0000	cwa01_01		
6170	72.0000	-142.0000	cwa01_01		
6180	72.0000	-141.0000	cwa01_01	US Canada border	72 00 00 N,141 00 00 W
6190	69.6474	-141.0000	cwa01_01	Coast and border	69 37 00 N,141 00 00 W
6200	69.0000	-142.0000	cwa01_01		
6210	69.9693	-156.0236	cwa01_01		
6220	70.5762	-160.1907	cwa01_01	CIS common chart boundary	n/a
6230	71.4257	-164.0500	cwa01_01	CIS common chart boundary	n/a
6240	74.0822	-157.7494	cwa01_01	CIS common chart boundary	n/a
6250	72.4794	-147.2406	cwa01_01	CIS common chart boundary	n/a
6260	72.0000	-141.0000	cwa01_02	US Canada border	72 00 00 N,141 00 00 W
6270	72.0000	-140.0000	cwa01_02		
6280	72.0000	-139.0000	cwa01_02		
6290	72.0000	-138.0000	cwa01_02		
6300	72.0000	-137.0000	cwa01_02		
6310	72.0000	-136.0000	cwa01_02		
6320	72.0000	-135.0000	cwa01_02	Estimated	72 00 00 N,135 00 00 W
6330	72.0000	-134.0000	cwa01_02		
6340	72.0000	-133.0000	cwa01_02		
6350	72.0000	-132.0000	cwa01_02		
6360	72.0000	-131.0000	cwa01_02	Estimated	72 00 00 N,131 00 00 W
6370	70.5761	-128.0385	cwa01_02		
6380	70.5669	-128.0000	cwa01_02	Cape Bathurst	70 34 00 N,128 00 00 W
6390	70.5656	-127.9987	cwa01_02		
6400	70.2045	-127.2075	cwa01_02		
6410	69.1997	-126.5959	cwa01_02		
6420	68.5500	-132.0000	cwa01_02		
6430	68.5000	-137.0000	cwa01_02		
6440	69.3211	-140.7362	cwa01_02		
6450	69.6474	-141.0000	cwa01_02	Coast and border	69 37 00 N,141 00 00 W
6460	72.0000	-141.0000	cwa01_02	US Canada border	72 00 00 N,141 00 00 W
6470	72.0000	-131.0000	cwa01_03	Estimated	72 00 00 N,131 00 00 W
6480	74.3413	-124.7759	cwa01_03	Cape Prince Alfred	74 20 00 N,124 46 00 W
6490	74.3385	-124.2905	cwa01_03		
6500	72.9400	-122.1492	cwa01_03		
6510	72.0000	-125.7013	cwa01_03		
6520	71.9560	-125.7938	cwa01_03		
6530	71.9628	-125.9439	cwa01_03		
6540	71.9673	-126.0000	cwa01_03	Cape Kellett	71 58 20 N,126 00 00 W
6550	70.5669	-128.0000	cwa01_03	Cape Bathurst	70 34 00 N,128 00 00 W
6560	70.5761	-128.0385	cwa01_03		
6570	72.0000	-131.0000	cwa01_03	Estimated	72 00 00 N,131 00 00 W
6580	76.0000	-127.0000	cwa01_04	Estimated	76 00 00 N,127 00 00 W
6590	76.0000	-126.0000	cwa01_04		
6600	76.0000	-125.0000	cwa01_04		
6610	76.0000	-124.0000	cwa01_04		
6620	76.0000	-123.0000	cwa01_04		
6630	76.0000	-122.3742	cwa01_04		
6640	75.9710	-122.4598	cwa01_04		
6650	75.9746	-122.7133	cwa01_04	Unnamed point N of Perseverance Point	75 58 30 N,122 43 00 W

6660	74.3413	-124.7759	cwa01_04	Cape Prince Alfred	74 20 00 N,124 46 00 W
6670	72.0000	-131.0000	cwa01_04	Estimated	72 00 00 N,131 00 00 W
6680	72.0000	-132.0000	cwa01_04		
6690	72.0000	-133.0000	cwa01_04		
6700	72.0000	-134.0000	cwa01_04		
6710	72.0000	-135.0000	cwa01_04	Estimated	72 00 00 N,135 00 00 W
6720	76.0000	-127.0000	cwa01_04	Estimated	76 00 00 N,127 00 00 W
6730	72.4794	-147.2406	cwa01_05	CIS common chart boundary	n/a
6740	76.0000	-137.4117	cwa01_05	CIS common chart boundary	n/a
6750	76.0000	-136.0000	cwa01_05		
6760	76.0000	-135.0000	cwa01_05		
6770	76.0000	-134.0000	cwa01_05		
6780	76.0000	-133.0000	cwa01_05		
6790	76.0000	-132.0000	cwa01_05		
6800	76.0000	-131.0000	cwa01_05		
6810	76.0000	-130.0000	cwa01_05		
6820	76.0000	-129.0000	cwa01_05		
6830	76.0000	-128.0000	cwa01_05		
6840	76.0000	-127.0000	cwa01_05	Estimated	76 00 00 N,127 00 00 W
6850	72.0000	-135.0000	cwa01_05	Estimated	72 00 00 N,135 00 00 W
6860	72.0000	-136.0000	cwa01_05		
6870	72.0000	-137.0000	cwa01_05		
6880	72.0000	-138.0000	cwa01_05		
6890	72.0000	-139.0000	cwa01_05		
6900	72.0000	-140.0000	cwa01_05		
6910	72.0000	-141.0000	cwa01_05	US Canada border	72 00 00 N,141 00 00 W
6920	72.0000	-142.0000	cwa01_05		
6930	72.0000	-143.0000	cwa01_05		
6940	72.0000	-144.0000	cwa01_05		
6950	72.0000	-145.0000	cwa01_05		
6960	72.0000	-146.0000	cwa01_05	Estimated	72 00 00 N,146 00 00 W
6970	72.4794	-147.2406	cwa01_05	CIS common chart boundary	n/a
6980	80.5893	-103.5425	tea02_12	CIS common chart boundary	n/a
6990	81.3480	-93.1539	tea02_12	CIS common chart boundary (NE Axel Heiberg I.)	n/a
7000	80.2500	-92.0000	tea02_12		
7010	80.3078	-96.3984	tea02_12		
7020	80.3486	-96.5798	tea02_12	Cape Northwest	80 21 00 N,96 36 00 W
7030	80.1296	-99.1313	tea02_12	Unnamed NE corner of Meighen I.	80 07 00 N,99 07 00 W
7040	79.8698	-100.0000	tea02_12	Where 100W hits SW Meighen I.	79 52 00 N,100 00 00 W
7050	79.3681	-103.8930	tea02_12	EA 1997/98 chart boundary (NE Ellef Ringnes I.)	79 22 00 N,103 53 00 W
7060	80.3408	-106.0662	tea02_12		
7070	80.5893	-103.5425	tea02_12	CIS common chart boundary	n/a
7080	79.3681	-103.8930	twa02_13	EA 1997/98 chart boundary (NE Ellef Ringnes I.)	79 22 00 N,103 53 00 W
7090	79.2652	-103.6864	twa02_13		
7100	79.0317	-105.5758	twa02_13	SW corner of N. part of Isachsen Penin.	79 02 00 N,105 34 00 W
7110	78.6925	-110.0000	twa02_13	Where 110W hits N Borden I.	78 40 00 N,110 00 00 W
7120	78.5937	-110.6208	twa02_13		
7130	78.4444	-112.4688	twa02_13		
7140	78.2813	-113.0000	twa02_13	Where 113W hits SW Borden I.	78 18 00 N,113 00 00 W
7150	78.0000	-114.1171	twa02_13	Where 78N meets E Brock I.	78 00 00 N,114 05 00 W
7160	77.8333	-114.7513	twa02_13	Where 77 50 N hits W Brock I.	77 50 00 N,114 45 00 W
7170	77.4950	-116.0534	twa02_13	Cape Krabbe	77 34 00 N,116 02 00 W
7180	77.0832	-117.1608	twa02_13		

7190	76.2414	-120.6769	twa02_13		
7200	76.0989	-122.0788	twa02_13		
7210	76.0000	-122.3742	twa02_13		
7220	76.0000	-123.0000	twa02_13		
7230	76.0000	-124.0000	twa02_13		
7240	76.0000	-125.0000	twa02_13		
7250	76.0000	-126.0000	twa02_13		
7260	76.0000	-127.0000	twa02_13	Estimated	76 00 00 N,127 00 00 W
7270	76.0000	-128.0000	twa02_13		
7280	76.0000	-129.0000	twa02_13		
7290	76.0000	-130.0000	twa02_13		
7300	76.0000	-131.0000	twa02_13		
7310	76.0000	-132.0000	twa02_13		
7320	76.0000	-133.0000	twa02_13		
7330	76.0000	-134.0000	twa02_13		
7340	76.0000	-135.0000	twa02_13		
7350	76.0000	-136.0000	twa02_13		
7360	76.0000	-137.4117	twa02_13	CIS common chart boundary	n/a
7370	76.3713	-136.0000	twa02_13	CIS common chart boundary	n/a
7380	77.4981	-131.0000	twa02_13	CIS common chart boundary	n/a
7390	78.3871	-126.0000	twa02_13	CIS common chart boundary	n/a
7400	79.0938	-121.0000	twa02_13	CIS common chart boundary	n/a
7410	79.6564	-116.0000	twa02_13	CIS common chart boundary	n/a
7420	80.1020	-111.0000	twa02_13	CIS common chart boundary	n/a
7430	80.4318	-106.2927	twa02_13	CIS common chart boundary	n/a
7440	80.5893	-103.5425	twa02_13	CIS common chart boundary	n/a
7450	80.3408	-106.0662	twa02_13		
7460	79.3681	-103.8930	twa02_13	EA 1997/98 chart boundary (NE Ellef Ringnes I.)	79 22 00 N,103 53 00 W
7470	77.0832	-117.1608	twa03_11		
7480	76.9490	-115.7080	twa03_11	Cape Hemphill (Prince Patrick I.)	76 56 00 N,115 42 00 W
7490	76.7563	-114.8095	twa03_11	Unnamed SW tip of Emerald I.	76 45 00 N,114 48 00 W
7500	76.5202	-114.8971	twa03_11	Point on N end of Sproule Penin. (Melvile I.)	76 30 00 N,114 50 00 W
7510	76.0305	-114.1069	twa03_11		
7520	75.5775	-114.3624	twa03_11		
7530	75.2466	-117.6538	twa03_11	Cape Russell	75 14 00 N,117 39 00 W
7540	75.4996	-118.5756	twa03_11	Pedder Point	75 30 00 N,118 34 00 W
7550	75.6717	-118.6426	twa03_11		
7560	75.6106	-119.4035	twa03_11	Cape Nares	75 37 00 N,119 25 00 W
7570	75.8130	-120.3522	twa03_11	Cape Cam	75 49 00 N,120 16 00 W
7580	76.0800	-120.1818	twa03_11		
7590	76.2414	-120.6769	twa03_11		
7600	77.0832	-117.1608	twa03_11		
7610	78.5937	-110.6208	twa03_12		
7620	78.3118	-109.3793	twa03_12	Unnamed SE corner of Borden I.	78 20 00 N,109 20 00 W
7630	78.1002	-109.6577	twa03_12	Unnamed NE corner of Mackenzie King I.	78 05 00 N,109 40 00 W
7640	77.9103	-111.4636	twa03_12		
7650	77.5566	-110.0591	twa03_12	Unnamed SE corner of Mackenzie King I.	77 33 00 N,110 05 00 W
7660	76.8502	-108.7504	twa03_12	Cape George Richards (Melville I.)	76 51 00 N,108 45 00 W
7670	76.0805	-108.9261	twa03_12		
7680	75.1728	-107.1578	twa03_12		
7690	75.0675	-110.1506	twa03_12		
7700	75.3709	-110.8557	twa03_12		

7710	75.5775	-114.3624	twa03_12		
7720	76.0305	-114.1069	twa03_12		
7730	76.5202	-114.8971	twa03_12	Point on N end of Sproule Penin. (Melvile I.)	76 30 00 N,114 50 00 W
7740	76.7563	-114.8095	twa03_12	Unnamed SW tip of Emerald I.	76 45 00 N,114 48 00 W
7750	76.9490	-115.7080	twa03_12	Cape Hemphill (Prince Patrick I.)	76 56 00 N,115 42 00 W
7760	77.0832	-117.1608	twa03_12		
7770	77.4950	-116.0534	twa03_12	Cape Krabbe	77 34 00 N,116 02 00 W
7780	77.8333	-114.7513	twa03_12	Where 77 50 N hits W Brock I.	77 50 00 N,114 45 00 W
7790	78.0000	-114.1171	twa03_12	Where 78N meets E Brock I.	78 00 00 N,114 05 00 W
7800	78.2813	-113.0000	twa03_12	Where 113W hits SW Borden I.	78 18 00 N,113 00 00 W
7810	78.4444	-112.4688	twa03_12		
7820	78.5937	-110.6208	twa03_12		
7830	79.2652	-103.6864	twa03_13		
7840	78.7572	-102.7228	twa03_13		
7850	78.2413	-104.0000	twa03_13	Where 104W hits Noice Penin. (Ellef Ringnes I.)	78 23 00 N,104 00 00 W
7860	77.7497	-106.0000	twa03_13	Where 106W hits N coast of Lougheed I.	77 48 00 N,106 00 00 W
7870	77.1704	-105.0000	twa03_13	Where 105W hits S coast of Lougheed I.	77 10 00 N,105 00 00 W
7880	76.5931	-104.6530	twa03_13	Unnamed NW corner of Cameron I.	76 37 00 N,104 40 00 W
7890	76.5838	-104.0000	twa03_13		
7900	76.1661	-104.0000	twa03_13		
7910	76.0876	-104.3889	twa03_13	Most W point on Ile Vanier	76 05 00 N,104 30 00 W
7920	76.0000	-105.8364	twa03_13	Where 76N hits W coast of Melville I.	76 00 00 N,105 45 00 W
7930	75.1728	-107.1578	twa03_13		
7940	76.0805	-108.9261	twa03_13		
7950	76.8502	-108.7504	twa03_13	Cape George Richards (Melville I.)	76 51 00 N,108 45 00 W
7960	77.5566	-110.0591	twa03_13	Unnamed SE corner of Mackenzie King I.	77 33 00 N,110 05 00 W
7970	77.9103	-111.4636	twa03_13		
7980	78.1002	-109.6577	twa03_13	Unnamed NE corner of Mackenzie King I.	78 05 00 N,109 40 00 W
7990	78.3118	-109.3793	twa03_13	Unnamed SE corner of Borden I.	78 20 00 N,109 20 00 W
8000	78.5937	-110.6208	twa03_13		
8010	78.6925	-110.0000	twa03_13	Where 110W hits N Borden I.	78 40 00 N,110 00 00 W
8020	79.0317	-105.5758	twa03_13	SW corner of N. part of Isachsen Penin.	79 02 00 N,105 34 00 W
8030	79.2652	-103.6864	twa03_13		
8040	76.1661	-104.0000	twa03_14		
8050	76.1702	-103.0000	twa03_14		
8060	75.8755	-103.0000	twa03_14		
8070	75.7792	-102.3305	twa03_14		
8080	75.8267	-101.9529	twa03_14		
8090	75.7275	-101.3599	twa03_14		
8100	75.7207	-99.0000	twa03_14		
8110	75.1123	-99.0301	twa03_14		
8120	75.0000	-100.2090	twa03_14	Cape Cockburn	75 02 00 N, 100 22 00
8130	75.0000	-101.0000	twa03_14		
8140	75.0000	-102.0000	twa03_14		
8150	75.0000	-103.0000	twa03_14		
8160	75.0000	-104.0000	twa03_14		
8170	75.0000	-105.0000	twa03_14		
8180	75.0000	-106.0000	twa03_14		
8190	75.0000	-106.5000	twa03_14		

8200	75.0000	-106.5150	twa03_14	Latitude 75N and coast	75 00 00 N,106 20 00 W
8210	75.1728	-107.1578	twa03_14		
8220	76.0000	-105.8364	twa03_14	Where 76N hits W coast of Melville I.	76 00 00 N,105 45 00 W
8230	76.0876	-104.3889	twa03_14	Most W point on Ile Vanier	76 05 00 N,104 30 00 W
8240	76.1661	-104.0000	twa03_14		
8250	78.7572	-102.7228	twa03_15		
8260	78.2668	-101.8588	twa03_15	CIS common chart boundary	n/a
8270	78.2215	-101.7783	twa03_15	CIS common chart boundary	n/a
8280	78.1585	-101.6672	twa03_15	CIS common chart boundary	n/a
8290	77.7932	-101.0463	twa03_15	CIS common chart boundary	n/a
8300	77.7281	-100.9396	twa03_15	CIS common chart boundary	n/a
8310	76.6983	-99.3892	twa03_15	CIS common chart boundary	n/a
8320	76.6063	-98.9913	twa03_15		
8330	76.5495	-98.5605	twa03_15		
8340	76.2203	-98.9713	twa03_15		
8350	75.7177	-98.3846	twa03_15		
8360	75.7207	-99.0000	twa03_15		
8370	75.7275	-101.3599	twa03_15		
8380	75.8267	-101.9529	twa03_15		
8390	75.7792	-102.3305	twa03_15		
8400	75.8755	-103.0000	twa03_15		
8410	76.1702	-103.0000	twa03_15		
8420	76.1661	-104.0000	twa03_15		
8430	76.5838	-104.0000	twa03_15		
8440	76.5931	-104.6530	twa03_15	Unnamed NW corner of Cameron I.	76 37 00 N,104 40 00 W
8450	77.1704	-105.0000	twa03_15	Where 105W hits S coast of Lougheed I.	77 10 00 N,105 00 00 W
8460	77.7497	-106.0000	twa03_15	Where 106W hits N coast of Lougheed I.	77 48 00 N,106 00 00 W
8470	78.2413	-104.0000	twa03_15	Where 104W hits Noice Penin. (Ellef Ringnes I.)	78 23 00 N,104 00 00 W
8480	78.7572	-102.7228	twa03_15		
8490	80.2500	-92.0000	tea03_16		
8500	79.3699	-89.4239	tea03_16		
8510	78.1996	-92.0468	tea03_16	Cape Southwest	78 12 00 N,92 02 00 W
8520	77.9500	-95.1167	tea03_16	Cape Ludwig	77 57 00 N,95 07 00 W
8530	78.0000	-95.2000	tea03_16		
8540	78.0000	-97.0000	tea03_16		
8550	78.0004	-97.4800	tea03_16	Where 78N hits W coast of Amund Ringnes I.	78 00 00 N,97 30 00 W
8560	78.0000	-98.0000	tea03_16		
8570	78.0000	-99.0000	tea03_16		
8580	78.0000	-99.0500	tea03_16	Where 78N hits Ellef Ringnes I.	78 00 00 N,99 00 00 W
8590	78.7572	-102.7228	tea03_16		
8600	79.2652	-103.6864	tea03_16		
8610	79.3681	-103.8930	tea03_16	EA 1997/98 chart boundary (NE Ellef Ringnes I.)	79 22 00 N,103 53 00 W
8620	79.8698	-100.0000	tea03_16	Where 100W hits SW Meighen I.	79 52 00 N,100 00 00 W
8630	80.1296	-99.1313	tea03_16	Unnamed NE corner of Meighen I.	80 07 00 N,99 07 00 W
8640	80.3486	-96.5798	tea03_16	Cape Northwest	80 21 00 N,96 36 00 W
8650	80.3078	-96.3984	tea03_16		
8660	80.2500	-92.0000	tea03_16		
8670	78.0000	-97.0000	tea03_17		
8680	77.8003	-96.9154	tea03_17		
8690	77.7915	-96.8202	tea03_17	Point on SW corner Amund Rignes I. facing Cornwall	77 48 00 N,96 50 00 W

8700	77.6945	-96.2446	tea03_17	Small point closest to Amund Rignes I.	77 40 00 N,95 20 00 W
8710	77.4789	-96.0000	tea03_17	Where 96W hits SE tip of Cornwall I.	77 41 00 N,96 14 00 W
8720	76.9830	-96.7935	tea03_17	Unnamed point on Grinnell Penin.	76 59 00 N,96 47 00 W
8730	76.6779	-98.4492	tea03_17	NE corner of point on NE Bathurst I.	76 42 00 N,78 25 00 W
8740	76.6565	-98.4227	tea03_17		
8750	76.5495	-98.5605	tea03_17		
8760	76.6063	-98.9913	tea03_17		
8770	76.6983	-99.3892	tea03_17	CIS common chart boundary	n/a
8780	77.7281	-100.9396	tea03_17	CIS common chart boundary	n/a
8790	77.7932	-101.0463	tea03_17	CIS common chart boundary	n/a
8800	78.1585	-101.6672	tea03_17	CIS common chart boundary	n/a
8810	78.2215	-101.7783	tea03_17	CIS common chart boundary	n/a
8820	78.2668	-101.8588	tea03_17	CIS common chart boundary	n/a
8830	78.7572	-102.7228	tea03_17		
8840	78.0000	-99.0500	tea03_17	Where 78N hits Ellef Ringnes I.	78 00 00 N,99 00 00 W
8850	78.0000	-99.0000	tea03_17		
8860	78.0000	-98.0000	tea03_17		
8870	78.0004	-97.4800	tea03_17	Where 78N hits W coast of Amund Ringnes I.	78 00 00 N,97 30 00 W
8880	78.0000	-97.0000	tea03_17		
8890	75.7177	-98.3846	twa03_18		
8900	75.5234	-97.4381	twa03_18		
8910	75.5089	-97.3876	twa03_18	E coast of unnamed penin. on SE Bathurst I.	75 30 00 N,97 20 00 W
8920	75.5044	-96.9922	twa03_18	W coast of LCI	75 30 00 N,96 59 00 W
8930	75.5819	-96.2789	twa03_18		
8940	75.5131	-96.0000	twa03_18	Where 96W hits SE coast of LCI	75 32 00 N,96 00 00 W
8950	75.4366	-96.0000	twa03_18	Where 96W hits W Cornwallis I.	75 25 00 N,96 00 00 W
8960	75.3334	-95.5933	twa03_18		
8970	75.3224	-95.0000	twa03_18		
8980	75.1614	-95.0000	twa03_18		
8990	75.1774	-95.9249	twa03_18		
9000	74.9098	-96.3309	twa03_18	Cape Rosse	75 54 00 N,96 19 00 W
9010	75.0277	-96.2456	twa03_18		
9020	75.0369	-96.5033	twa03_18		
9030	75.0000	-96.6119	twa03_18	Latitude 75N and coast	75 00 00 N,96 36 00 W
9040	75.0000	-97.0000	twa03_18		
9050	75.0000	-98.0000	twa03_18		
9060	75.0000	-98.4469	twa03_18	Latitude 75N and coast	75 00 00 N,98 30 00 W
9070	75.1123	-99.0301	twa03_18		
9080	75.7207	-99.0000	twa03_18		
9090	75.7177	-98.3846	twa03_18		
9100	76.9830	-96.7935	tea03_19	Unnamed point on Grinnell Penin.	76 59 00 N,96 47 00 W
9110	76.4779	-94.1429	tea03_19		
9120	76.2461	-95.0000	tea03_19	Where 95W hits S coast of Grinnell Penin.	76 22 00 N,95 00 00 W
9130	76.0775	-95.0000	tea03_19		
9140	75.6189	-95.0000	tea03_19	Where 95W hits N coast of Cornwallis I.	75 39 00 N,95 00 00 W
9150	75.3224	-95.0000	tea03_19		
9160	75.3334	-95.5933	tea03_19		
9170	75.4366	-96.0000	tea03_19	Where 96W hits W Cornwallis I.	75 25 00 N,96 00 00 W
9180	75.5131	-96.0000	tea03_19	Where 96W hits SE coast of LCI	75 32 00 N,96 00 00 W
9190	75.5819	-96.2789	tea03_19		
9200	75.5044	-96.9922	tea03_19	W coast of LCI	75 30 00 N,96 59 00 W

9210	75.5089	-97.3876	tea03_19	E coast of unnamed penin. on SE Bathurst I.	75 30 00 N,97 20 00 W
9220	75.5234	-97.4381	tea03_19		
9230	75.7177	-98.3846	tea03_19		
9240	76.2203	-98.9713	tea03_19		
9250	76.5495	-98.5605	tea03_19		
9260	76.6565	-98.4227	tea03_19		
9270	76.6779	-98.4492	tea03_19	NE corner of point on NE Bathurst I.	76 42 00 N,78 25 00 W
9280	76.9830	-96.7935	tea03_19	Unnamed point on Grinnell Penin.	76 59 00 N,96 47 00 W
9290	76.4779	-94.1429	tea03_20		
9300	76.3800	-93.7013	tea03_20		
9310	76.3988	-92.2111	tea03_20		
9320	75.2084	-91.0967	tea03_20		
9330	74.7114	-91.3904	tea03_20		
9340	74.6665	-91.6860	tea03_20	Unnamed point SW corner of Devon I.	73 39 00 N,91 40 00 W
9350	74.6670	-93.5388	tea03_20	Cape Dungeness	74 39 00 N,93 43 00 W
9360	75.1430	-94.1254	tea03_20		
9370	75.1614	-95.0000	tea03_20		
9380	75.3224	-95.0000	tea03_20		
9390	75.6189	-95.0000	tea03_20	Where 95W hits N coast of Cornwallis I.	75 39 00 N,95 00 00 W
9400	76.0775	-95.0000	tea03_20		
9410	76.2461	-95.0000	tea03_20	Where 95W hits S coast of Grinnell Penin.	76 22 00 N,95 00 00 W
9420	76.4779	-94.1429	tea03_20		
9430	76.2414	-120.6769	cwa04_01		
9440	76.0800	-120.1818	cwa04_01		
9450	75.8130	-120.3522	cwa04_01	Cape Cam	75 49 00 N,120 16 00 W
9460	75.6106	-119.4035	cwa04_01	Cape Nares	75 37 00 N,119 25 00 W
9470	75.6717	-118.6426	cwa04_01		
9480	75.4996	-118.5756	cwa04_01	Pedder Point	75 30 00 N,118 34 00 W
9490	75.2466	-117.6538	cwa04_01	Cape Russell	75 14 00 N,117 39 00 W
9500	75.5775	-114.3624	cwa04_01		
9510	75.3709	-110.8557	cwa04_01		
9520	75.0675	-110.1506	cwa04_01		
9530	74.3994	-113.0000	cwa04_01	Cape Hay	74 25 00 N,113 04 00 W
9540	73.5369	-115.3156	cwa04_01	Russell Point	73 32 00 N,115 18 00 W
9550	72.9400	-122.1492	cwa04_01		
9560	74.3385	-124.2905	cwa04_01		
9570	74.3413	-124.7759	cwa04_01	Cape Prince Alfred	74 20 00 N,124 46 00 W
9580	75.9746	-122.7133	cwa04_01	Unnamed point N of Perseverance Point	75 58 30 N,122 43 00 W
9590	75.9710	-122.4598	cwa04_01		
9600	76.0000	-122.3742	cwa04_01		
9610	76.0989	-122.0788	cwa04_01		
9620	76.2414	-120.6769	cwa04_01		
9630	75.1728	-107.1578	cwa04_02		
9640	75.0000	-106.5150	cwa04_02	Latitude 75N and coast	75 00 00 N,106 20 00 W
9650	75.0000	-106.5000	cwa04_02		
9660	75.0000	-106.0000	cwa04_02		
9670	75.0000	-105.0000	cwa04_02		
9680	75.0000	-104.0000	cwa04_02		
9690	75.0000	-103.0000	cwa04_02		
9700	75.0000	-102.0000	cwa04_02		
9710	75.0000	-101.0000	cwa04_02		
9720	75.0000	-100.2090	cwa04_02	Cape Cockburn	75 02 00 N, 100 22 00

9730	75.1123	-99.0301	cwa04_02		
9740	75.0000	-98.4469	cwa04_02	Latitude 75N and coast	75 00 00 N,98 30 00 W
9750	75.0000	-98.0000	cwa04_02		
9760	74.1110	-98.0000	cwa04_02	Where 98W hits N coast of Russell I.	74 06 00 N,98 00 00 W
9770	73.9311	-98.0000	cwa04_02	Where 98W hits S coast of Russell I.	73 50 00 N,98 00 00 W
9780	73.8357	-98.0000	cwa04_02		
9790	73.1274	-98.7224	cwa04_02		
9800	73.7009	-100.0558	cwa04_02		
9810	73.7321	-101.1139	cwa04_02	Cape Eden	73 47 00 N,101 02 00 W
9820	73.7117	-105.0000	cwa04_02	105W and coast (NE corner Stefanson I.)	73 26 00 N,105 00 00 W
9830	73.4649	-107.0000	cwa04_02	107W and coast (NW corner Stefanson I.)	73 28 00 N,107 00 00 W
9840	73.3005	-107.0000	cwa04_02	107W and coast (Storkerson Penin. Victoria I.)	73 18 00 N,107 00 00 W
9850	72.9994	-106.4744	cwa04_02		
9860	70.2031	-106.3783	cwa04_02		
9870	72.4717	-118.5272	cwa04_02	Hay Point	72 24 00 N,118 32 00 W
9880	72.4731	-119.2530	cwa04_02	Unnamed point across from Hay Point (E Banks	72 20 00 N,119 20 00 W
9890	72.9400	-122.1492	cwa04_02		
9900	73.5369	-115.3156	cwa04_02	Russell Point	73 32 00 N,115 18 00 W
9910	74.3994	-113.0000	cwa04_02	Cape Hay	74 25 00 N,113 04 00 W
9920	75.0675	-110.1506	cwa04_02		
9930	75.1728	-107.1578	cwa04_02		
9940	74.9098	-96.3309	cwa04_03	Cape Rosse	75 54 00 N,96 19 00 W
9950	73.9878	-95.2970	cwa04_03	Pressure Point	73 59 00 N,95 18 00 W
9960	73.8510	-97.1783	cwa04_03	Lyons Point	73 51 00 N,97 11 00 W
9970	73.7672	-97.5441	cwa04_03		
9980	73.8357	-98.0000	cwa04_03		
9990	73.9311	-98.0000	cwa04_03	Where 98W hits S coast of Russell I.	73 50 00 N,98 00 00 W
10000	74.1110	-98.0000	cwa04_03	Where 98W hits N coast of Russell I.	74 06 00 N,98 00 00 W
10010	75.0000	-98.0000	cwa04_03		
10020	75.0000	-97.0000	cwa04_03		
10030	75.0000	-96.6119	cwa04_03	Latitude 75N and coast	75 00 00 N,96 36 00 W
10040	75.0369	-96.5033	cwa04_03		
10050	75.0277	-96.2456	cwa04_03		
10060	74.9098	-96.3309	cwa04_03	Cape Rosse	75 54 00 N,96 19 00 W
10070	69.2513	-123.2099	cwa05_01		
10080	69.8282	-122.9529	cwa05_01	Cape Lyon	69 50 01 N,122 57 08 W
10090	71.0783	-123.1410	cwa05_01	Cape Lambton	71 05 01 N,123 09 10 W
10100	72.9400	-122.1492	cwa05_01		
10110	72.4731	-119.2530	cwa05_01	Unnamed point across from Hay Point (E Banks	72 20 00 N,119 20 00 W
10120	72.4717	-118.5272	cwa05_01	Hay Point	72 24 00 N,118 32 00 W
10130	70.2031	-106.3783	cwa05_01		
10140	69.8485	-110.6008	cwa05_01		
10150	70.0394	-117.3645	cwa05_01	Cape Baring	70 02 15 N,117 21 25 W
10160	69.2192	-118.6281	cwa05_01	Clifton Point	69 13 00 N,118 38 00 W
10170	69.2513	-123.2099	cwa05_01		
10180	70.2031	-106.3783	cwa05_02		
10190	69.0774	-103.2990	cwa05_02		
10200	69.0765	-102.2309	cwa05_02		
10210	69.0000	-101.8617	cwa05_02	Where 69N hits SE corner of Victoria I.	69 00 00 N,101 50 00 W
10220	69.0000	-100.6129	cwa05_02		

10230	69.0000	-100.3085	cwa05_02		
10240	69.0000	-100.2090	cwa05_02		
10250	69.0000	-99.9640	cwa05_02		
10260	69.0000	-99.5095	cwa05_02	Where 69N hits W coast of King William I.	69 00 00 N,99 30 00 W
10270	69.0283	-99.4205	cwa05_02		
10280	69.0999	-97.8814	cwa05_02		
10290	69.5578	-97.0000	cwa05_02	Where 97W hits E coast of King William I.	69 35 00 N,97 00 00 W
10300	69.6108	-94.9940	cwa05_02	Where 95W hits SW coast of Boothia Penin.	69 38 00 N,95 00 00 W
10310	69.8888	-94.5932	cwa05_02		
10320	69.6558	-93.2444	cwa05_02		
10330	69.3160	-93.0610	cwa05_02		
10340	67.8744	-93.4801	cwa05_02		
10350	66.4214	-95.9320	cwa05_02		
10360	66.2252	-108.8511	cwa05_02		
10370	67.7000	-117.0467	cwa05_02		
10380	69.2192	-118.6281	cwa05_02	Clifton Point	69 13 00 N,118 38 00 W
10390	70.0394	-117.3645	cwa05_02	Cape Baring	70 02 15 N,117 21 25 W
10400	69.8485	-110.6008	cwa05_02		
10410	70.2031	-106.3783	cwa05_02		
10420	72.9400	-122.1492	cwa05_03		
10430	71.0783	-123.1410	cwa05_03	Cape Lambton	71 05 01 N,123 09 10 W
10440	69.8282	-122.9529	cwa05_03	Cape Lyon	69 50 01 N,122 57 08 W
10450	69.2513	-123.2099	cwa05_03		
10460	69.1997	-126.5959	cwa05_03		
10470	70.2045	-127.2075	cwa05_03		
10480	70.5656	-127.9987	cwa05_03		
10490	70.5669	-128.0000	cwa05_03	Cape Bathurst	70 34 00 N,128 00 00 W
10500	71.9673	-126.0000	cwa05_03	Cape Kellett	71 58 20 N,126 00 00 W
10510	71.9628	-125.9439	cwa05_03		
10520	71.9560	-125.7938	cwa05_03		
10530	72.0000	-125.7013	cwa05_03		
10540	72.9400	-122.1492	cwa05_03		
10670	71.2938	-98.6836	cwa07_01	Cape Swinburne	71 17 00 N,98 41 00 W
10680	70.8140	-96.5974	cwa07_01	Unnamed headland W coast of Boothia Penin.	70 50 00 N,96 40 00 W
10690	70.7392	-94.8720	cwa07_01		
10700	69.8888	-94.5932	cwa07_01		
10710	69.6108	-94.9940	cwa07_01	Where 95W hits SW coast of Boothia Penin.	69 38 00 N,95 00 00 W
10720	69.5578	-97.0000	cwa07_01	Where 97W hits E coast of King William I.	69 35 00 N,97 00 00 W
10730	69.0999	-97.8814	cwa07_01		
10740	69.0283	-99.4205	cwa07_01		
10750	69.0000	-99.5095	cwa07_01	Where 69N hits W coast of King William I.	69 00 00 N,99 30 00 W
10760	69.0000	-99.9640	cwa07_01		
10770	69.0000	-100.2090	cwa07_01		
10780	69.0000	-100.3085	cwa07_01		
10790	69.0000	-100.6129	cwa07_01		
10800	69.0000	-101.8617	cwa07_01	Where 69N hits SE corner of Victoria I.	69 00 00 N,101 50 00 W
10810	69.0765	-102.2309	cwa07_01		
10820	69.0774	-103.2990	cwa07_01		
10830	70.2031	-106.3783	cwa07_01		
10840	70.0333	-101.2876	cwa07_01		
10850	70.2063	-101.0000	cwa07_01	Cape Admiral Collinson	70 19 00 N,101 39 00 W

10860	71.2938	-98.6836	cwa07_01	Cape Swinburne	71 17 00 N,98 41 00 W
10870	73.9878	-95.2970	cwa07_02	Pressure Point	73 59 00 N,95 18 00 W
10880	73.8877	-94.9654	cwa07_02		
10890	73.6979	-94.1614	cwa07_02		
10900	73.4081	-94.5204	cwa07_02		
10910	72.2190	-94.7942	cwa07_02		
10920	71.9872	-95.0000	cwa07_02	Where 95W crosses Bellot Strait	n/a
10930	71.9769	-95.0000	cwa07_02	Where 95W crosses Bellot Strait	n/a
10940	71.8610	-95.0000	cwa07_02	Where 95W crosses Bellot Strait	n/a
10950	71.8552	-95.0000	cwa07_02	Where 95W crosses Bellot Strait	n/a
10960	71.6431	-94.9287	cwa07_02		
10970	71.1902	-95.3432	cwa07_02		
10980	70.8140	-96.5974	cwa07_02	Unnamed headland W coast of Boothia Penin.	70 50 00 N,96 40 00 W
10990	71.2938	-98.6836	cwa07_02	Cape Swinburne	71 17 00 N,98 41 00 W
11000	73.1274	-98.7224	cwa07_02		
11010	73.8357	-98.0000	cwa07_02		
11020	73.7672	-97.5441	cwa07_02		
11030	73.8510	-97.1783	cwa07_02	Lyons Point	73 51 00 N,97 11 00 W
11040	73.9878	-95.2970	cwa07_02	Pressure Point	73 59 00 N,95 18 00 W
11050	76.8110	-88.8748	cea08_02		
11060	77.0809	-83.8407	cea08_02		
11070	76.4005	-80.2683	cea08_02		
11080	76.1318	-81.0610	cea08_02	King Edward Point	76 07 55 N,81 03 00 W
11090	75.7743	-81.1455	cea08_02	Belcher Point	75 46 00 N,81 06 00 W
11100	75.0873	-82.8144	cea08_02		
11110	75.2084	-91.0967	cea08_02		
11120	76.3988	-92.2111	cea08_02		
11130	76.2464	-89.1855	cea08_02	Cape Vera	76 14 00 N,89 13 00 W
11140	76.4052	-88.8882	cea08_02	Unnamed SE point of Simmons Penin. (Jones S.)	76 24 00 N,88 53 00 W
11150	76.8110	-88.8748	cea08_02		
11160	81.3480	-93.1539	tea08_11	CIS common chart boundary (NE Axel Heiberg I.)	n/a
11170	81.4756	-90.6886	tea08_11	CIS common chart boundary (W Ellesmere I.)	n/a
11180	81.9336	-72.1873	tea08_11		
11190	78.8859	-80.2989	tea08_11		
11200	78.5089	-82.0223	tea08_11		
11210	78.5247	-85.9332	tea08_11		
11220	78.1779	-86.8072	tea08_11		
11230	78.1279	-87.5240	tea08_11	Unnamed point E of Hyperite Point	78 09 00 N,85 53 00 W
11240	78.1455	-88.8289	tea08_11	Hyperite Point	78 09 00 N,88 53 00 W
11250	79.3699	-89.4239	tea08_11		
11260	80.2500	-92.0000	tea08_11		
11270	81.3480	-93.1539	tea08_11	CIS common chart boundary (NE Axel Heiberg I.)	n/a
11280	78.8859	-80.2989	tea08_12		
11290	78.8509	-76.6345	tea08_12		
11300	77.0809	-83.8407	tea08_12		
11310	76.8110	-88.8748	tea08_12		
11320	76.8490	-89.5270	tea08_12	NW corner of Simmons Penin. (W Ellesmere I.)	76 50 00 N,89 30 00 W
11330	76.8202	-89.8898	tea08_12		
11340	76.7643	-90.5748	tea08_12		
11350	76.6914	-91.4305	tea08_12	N coast of Devon I.	76 40 00 N,91 30 00 W
11360	76.3988	-92.2111	tea08_12		
11370	76.3800	-93.7013	tea08_12		

11380	76.4779	-94.1429	tea08_12		
11390	76.9830	-96.7935	tea08_12	Unnamed point on Grinnell Penin.	76 59 00 N,96 47 00 W
11400	77.4789	-96.0000	tea08_12	Where 96W hits SE tip of Cornwall I.	77 41 00 N,96 14 00 W
11410	77.6945	-96.2446	tea08_12	Small point closest to Amund Rignes I.	77 40 00 N,95 20 00 W
11420	77.7915	-96.8202	tea08_12	Point on SW corner Amund Rignes I. facing Cornwall	77 48 00 N,96 50 00 W
11430	77.8003	-96.9154	tea08_12		
11440	78.0000	-97.0000	tea08_12		
11450	78.0000	-95.2000	tea08_12		
11460	77.9500	-95.1167	tea08_12	Cape Ludwig	77 57 00 N,95 07 00 W
11470	78.1996	-92.0468	tea08_12	Cape Southwest	78 12 00 N,92 02 00 W
11480	79.3699	-89.4239	tea08_12		
11490	78.1455	-88.8289	tea08_12	Hyperite Point	78 09 00 N,88 53 00 W
11500	78.1279	-87.5240	tea08_12	Unnamed point E of Hyperite Point	78 09 00 N,85 53 00 W
11510	78.1779	-86.8072	tea08_12		
11520	78.5247	-85.9332	tea08_12		
11530	78.5089	-82.0223	tea08_12		
11540	78.8859	-80.2989	tea08_12		
11550	76.8110	-88.8748	tea08_13		
11560	76.4052	-88.8882	tea08_13	Unnamed SE point of Simmons Penin. (Jones S.)	76 24 00 N,88 53 00 W
11570	76.2464	-89.1855	tea08_13	Cape Vera	76 14 00 N,89 13 00 W
11580	76.3988	-92.2111	tea08_13		
11590	76.6914	-91.4305	tea08_13	N coast of Devon I.	76 40 00 N,91 30 00 W
11600	76.7643	-90.5748	tea08_13		
11610	76.8202	-89.8898	tea08_13		
11620	76.8490	-89.5270	tea08_13	NW corner of Simmons Penin. (W Ellesmere I.)	76 50 00 N,89 30 00 W
11630	76.8110	-88.8748	tea08_13		
11640	75.0873	-82.8144	cea09_01		
11650	73.7385	-82.8539	cea09_01	Cape Charles Yorke	73 44 00 N,82 49 00 W
11660	73.7318	-86.3250	cea09_01		
11670	73.8164	-87.0011	cea09_01	Cape York	73 48 00 N,87 00 00 W
11680	73.9058	-90.1608	cea09_01	Cape Clarence	73 54 00 N,90 10 00 W
11690	73.8826	-90.4460	cea09_01		
11700	73.8877	-94.9654	cea09_01		
11710	73.9878	-95.2970	cea09_01	Pressure Point	73 59 00 N,95 18 00 W
11720	74.9098	-96.3309	cea09_01	Cape Rosse	75 54 00 N,96 19 00 W
11730	75.1774	-95.9249	cea09_01		
11740	75.1614	-95.0000	cea09_01		
11750	75.1430	-94.1254	cea09_01		
11760	74.6670	-93.5388	cea09_01	Cape Dungeness	74 39 00 N,93 43 00 W
11770	74.6665	-91.6860	cea09_01	Unnamed point SW corner of Devon I.	73 39 00 N,91 40 00 W
11780	74.7114	-91.3904	cea09_01		
11790	75.2084	-91.0967	cea09_01		
11800	75.0873	-82.8144	cea09_01		
11810	75.0873	-82.8144	cea09_02		
11820	74.5807	-80.2282	cea09_02	Cape Sherard	74 36 00 N,80 13 00 W
11830	73.7541	-80.8409	cea09_02	Unnamed cape NE tip of Bylot I.	73 44 00 N,80 40 00 W
11840	73.7336	-81.6004	cea09_02	Unnamed point of land NE tip of Borden Penin.	73 44 00 N,81 40 00 W
11850	73.6990	-81.6190	cea09_02		
11860	73.7179	-82.8210	cea09_02		
11870	73.7385	-82.8539	cea09_02	Cape Charles Yorke	73 44 00 N,82 49 00 W
11880	75.0873	-82.8144	cea09_02		

11890	73.7318	-86.3250	tea10_12		
11900	71.8332	-88.2846	tea10_12		
11910	70.6698	-86.3311	tea10_12		
11920	71.1128	-82.3143	tea10_12		
11930	70.3463	-83.1239	tea10_12		
11940	69.8602	-82.4474	tea10_12		
11950	69.6995	-82.5441	tea10_12		
11960	69.6949	-82.5869	tea10_12		
11970	69.6630	-82.5548	tea10_12		
11980	69.5490	-84.0098	tea10_12		
11990	67.5913	-84.0008	tea10_12		
12000	66.2368	-89.7788	tea10_12		
12010	68.0040	-91.3128	tea10_12		
12020	70.7977	-94.2929	tea10_12		
12030	71.8395	-94.9945	tea10_12		
12040	71.8552	-95.0000	tea10_12	Where 95W crosses Bellot Strait	n/a
12050	71.8610	-95.0000	tea10_12	Where 95W crosses Bellot Strait	n/a
12060	71.9769	-95.0000	tea10_12	Where 95W crosses Bellot Strait	n/a
12070	71.9872	-95.0000	tea10_12	Where 95W crosses Bellot Strait	n/a
12080	72.2190	-94.7942	tea10_12		
12090	73.4081	-94.5204	tea10_12		
12100	73.6979	-94.1614	tea10_12		
12110	73.8877	-94.9654	tea10_12		
12120	73.8826	-90.4460	tea10_12		
12130	73.9058	-90.1608	tea10_12	Cape Clarence	73 54 00 N,90 10 00 W
12140	73.8164	-87.0011	tea10_12	Cape York	73 48 00 N,87 00 00 W
12150	73.7318	-86.3250	tea10_12		
12160	73.7179	-82.8210	tea10_13		
12170	71.1128	-82.3143	tea10_13		
12180	70.6698	-86.3311	tea10_13		
12190	71.8332	-88.2846	tea10_13		
12200	73.7318	-86.3250	tea10_13		
12210	73.7385	-82.8539	tea10_13	Cape Charles Yorke	73 44 00 N,82 49 00 W
12220	73.7179	-82.8210	tea10_13		
12230	73.7541	-80.8409	tea10_14	Unnamed cape NE tip of Bylot I.	73 44 00 N,80 40 00 W
12240	72.8629	-76.0615	tea10_14	Cape Graham Moore	72 52 00 N,76 04 00 W
12250	72.5873	-75.8059	tea10_14	Cape Weld	72 35 00 N,75 46 00 W
12260	71.3328	-77.2790	tea10_14		
12270	71.1128	-82.3143	tea10_14		
12280	73.7179	-82.8210	tea10_14		
12290	73.6990	-81.6190	tea10_14		
12300	73.7336	-81.6004	tea10_14	Unnamed point of land NE tip of Borden Penin.	73 44 00 N,81 40 00 W
12310	73.7541	-80.8409	tea10_14	Unnamed cape NE tip of Bylot I.	73 44 00 N,80 40 00 W
12410	76.0806	-68.4242	cea12_01	Unnamed point NE and S of Thule	76 05 00 N,68 28 00 W
12420	77.4053	-60.6687	cea12_01		
12430	71.6262	-52.1573	cea12_01		
12440	71.5636	-52.2150	cea12_01		
12450	71.3935	-52.3701	cea12_01	CIS common chart boundary	n/a
12460	71.2200	-52.5253	cea12_01		
12470	71.1852	-52.5561	cea12_01		
12480	70.7489	-52.9331	cea12_01		
12490	70.3663	-53.2502	cea12_01		
12500	70.2062	-53.3793	cea12_01		
12510	69.5083	-53.9194	cea12_01		
12520	69.4396	-53.9706	cea12_01		

12530	69.3254	-54.0550	cea12_01		
12540	66.7026	-55.7734	cea12_01	CIS common chart boundary	n/a
12550	66.6165	-61.2577	cea12_01	Cape Dyer	66 37 00 N,61 16 00 W
12560	66.6206	-61.2924	cea12_01		
12570	66.6650	-61.3133	cea12_01		
12580	66.6718	-61.2832	cea12_01		
12590	76.0806	-68.4242	cea12_01	Unnamed point NE and S of Thule	76 05 00 N,68 28 00 W
12600	72.8629	-76.0615	cea12_02	Cape Graham Moore	72 52 00 N,76 04 00 W
12610	76.0806	-68.4242	cea12_02	Unnamed point NE and S of Thule	76 05 00 N,68 28 00 W
12620	66.6718	-61.2832	cea12_02		
12630	66.6650	-61.3133	cea12_02		
12640	66.6206	-61.2924	cea12_02		
12650	66.7252	-62.1870	cea12_02		
12660	66.5067	-62.8407	cea12_02		
12670	67.0682	-68.3554	cea12_02		
12680	71.3328	-77.2790	cea12_02		
12690	72.5873	-75.8059	cea12_02	Cape Weld	72 35 00 N,75 46 00 W
12700	72.8629	-76.0615	cea12_02	Cape Graham Moore	72 52 00 N,76 04 00 W
12710	77.4053	-60.6687	cea12_03		
12720	76.0806	-68.4242	cea12_03	Unnamed point NE and S of Thule	76 05 00 N,68 28 00 W
12730	72.8629	-76.0615	cea12_03	Cape Graham Moore	72 52 00 N,76 04 00 W
12740	73.7541	-80.8409	cea12_03	Unnamed cape NE tip of Bylot I.	73 44 00 N,80 40 00 W
12750	74.5807	-80.2282	cea12_03	Cape Sherard	74 36 00 N,80 13 00 W
12760	75.0873	-82.8144	cea12_03		
12770	75.7743	-81.1455	cea12_03	Belcher Point	75 46 00 N,81 06 00 W
12780	76.1318	-81.0610	cea12_03	King Edward Point	76 07 55 N,81 03 00 W
12790	76.4005	-80.2683	cea12_03		
12800	77.0809	-83.8407	cea12_03		
12810	78.8509	-76.6345	cea12_03		
12820	78.5863	-74.5952	cea12_03	Cape Herschel	78 35 00 N,74 35 00 W
12830	78.5110	-72.5952	cea12_03	Unnamed point across from Cape Herschel	78 30 00 N,72 45 00 W
12840	78.5143	-72.4951	cea12_03		
12850	77.4053	-60.6687	cea12_03		
13060	64.6615	-83.7054	chb14_01		
13070	63.5955	-84.0795	chb14_01	Bear Cove Point	63 35 20 N,84 05 35 W
13080	62.9104	-83.2811	chb14_01	Cape Netchek	62 56 00 N,83 17 00 W
13090	62.5357	-83.1513	chb14_01		
13100	62.9333	-81.9167	chb14_01	Cape Pembroke	62 56 00 N,81 55 00 W
13110	62.3833	-79.7167	chb14_01	N tip of Mansel I.	61 59 30 N,79 50 00 W
13120	61.5500	-79.8000	chb14_01	Cape Acadia	61 33 00 N,79 48 00 W
13130	58.7628	-93.2181	chb14_01	Cape Churchill	54 45 46 N,93 13 05 W
13140	58.4346	-94.3476	chb14_01		
13150	61.6105	-98.5101	chb14_01		
13160	63.7217	-92.1511	chb14_01		
13170	63.7645	-92.0015	chb14_01		
13180	64.6620	-88.5895	chb14_01		
13190	64.5014	-88.4763	chb14_01		
13200	64.6615	-83.7054	chb14_01		
13210	61.5500	-79.8000	chb14_02	Cape Acadia	61 33 00 N,79 48 00 W
13220	52.6727	-80.7152	chb14_02	Cape Duncan	52 40 00 N,80 43 00 W
13230	52.7840	-80.7751	chb14_02		
13240	53.3903	-84.6789	chb14_02		
13250	54.2276	-85.8601	chb14_02		
13260	54.3938	-86.1028	chb14_02		

13270	55.2979	-89.3532	chb14_02		
13280	55.2632	-91.0046	chb14_02		
13290	56.9384	-92.6842	chb14_02		
13300	56.9641	-92.7114	chb14_02		
13310	58.4346	-94.3476	chb14_02		
13320	58.7628	-93.2181	chb14_02	Cape Churchill	54 45 46 N,93 13 05 W
13330	61.5500	-79.8000	chb14_02	Cape Acadia	61 33 00 N,79 48 00 W
13340	62.5780	-78.1275	chb14_03	W tip of Diggers I.	n/a
13350	62.5806	-77.5097	chb14_03	Wolstanholme	62 34 50 N,77 30 35 W
13360	60.6337	-76.3923	chb14_03		
13370	56.5269	-74.4089	chb14_03		
13380	55.9040	-75.2245	chb14_03		
13390	54.1145	-77.3863	chb14_03		
13400	54.1142	-77.3863	chb14_03		
13410	53.0518	-77.1001	chb14_03		
13420	52.7323	-78.8455	chb14_03		
13430	52.1899	-81.4543	chb14_03		
13440	51.8852	-82.7713	chb14_03		
13450	52.9218	-84.0469	chb14_03		
13460	53.3903	-84.6789	chb14_03		
13470	52.7840	-80.7751	chb14_03		
13480	52.6727	-80.7152	chb14_03	Cape Duncan	52 40 00 N,80 43 00 W
13490	61.5500	-79.8000	chb14_03	Cape Acadia	61 33 00 N,79 48 00 W
13500	62.3833	-79.7167	chb14_03	N tip of Mansel I.	61 59 30 N,79 50 00 W
13510	62.5780	-78.1275	chb14_03	W tip of Diggers I.	n/a
13520	64.9197	-75.9634	chb14_04		
13530	62.5806	-77.5097	chb14_04	Wolstanholme	62 34 50 N,77 30 35 W
13540	62.5780	-78.1275	chb14_04	W tip of Diggers I.	n/a
13550	62.3833	-79.7167	chb14_04	N tip of Mansel I.	61 59 30 N,79 50 00 W
13560	62.9333	-81.9167	chb14_04	Cape Pembroke	62 56 00 N,81 55 00 W
13570	62.5357	-83.1513	chb14_04		
13580	62.9104	-83.2811	chb14_04	Cape Netchek	62 56 00 N,83 17 00 W
13590	63.5955	-84.0795	chb14_04	Bear Cove Point	63 35 20 N,84 05 35 W
13600	64.6615	-83.7054	chb14_04		
13610	64.6824	-80.5172	chb14_04		
13620	64.8276	-78.0708	chb14_04		
13630	64.8371	-77.8828	chb14_04		
13640	64.9197	-75.9634	chb14_04		
15230	81.3480	-93.1539	cea08_01	CIS common chart boundary (NE Axel Heiberg I.)	n/a
15240	81.4756	-90.6886	cea08_01	CIS common chart boundary (W Ellesmere I.)	n/a
15250	81.9336	-72.1873	cea08_01		
15260	78.8859	-80.2989	cea08_01		
15270	78.8509	-76.6345	cea08_01		
15280	77.0809	-83.8407	cea08_01		
15290	76.8110	-88.8748	cea08_01		
15300	76.8490	-89.5270	cea08_01	NW corner of Simmons Penin. (W Ellesmere I.)	76 50 00 N,89 30 00 W
15310	76.8202	-89.8898	cea08_01		
15320	76.7643	-90.5748	cea08_01		
15330	76.6914	-91.4305	cea08_01	N coast of Devon I.	76 40 00 N,91 30 00 W
15340	76.3988	-92.2111	cea08_01		
15350	76.3800	-93.7013	cea08_01		
15360	76.4779	-94.1429	cea08_01		
15370	76.9830	-96.7935	cea08_01	Unnamed point on Grinnell Penin.	76 59 00 N,96 47 00 W

15380	77.4789	-96.0000	cea08_01	Where 96W hits SE tip of Cornwall I.	77 41 00 N,96 14 00 W
15390	77.6945	-96.2446	cea08_01	Small point closest to Amund Rignes I.	77 40 00 N,95 20 00 W
15400	77.7915	-96.8202	cea08_01	Point on SW corner Amund Rignes I. facing Cornwall	77 48 00 N,96 50 00 W
15410	77.8003	-96.9154	cea08_01		
15420	78.0000	-97.0000	cea08_01		
15430	78.0000	-95.2000	cea08_01		
15440	77.9500	-95.1167	cea08_01	Cape Ludwig	77 57 00 N,95 07 00 W
15450	78.1996	-92.0468	cea08_01	Cape Southwest	78 12 00 N,92 02 00 W
15460	79.3699	-89.4239	cea08_01		
15470	80.2500	-92.0000	cea08_01		
15480	81.3480	-93.1539	cea08_01	CIS common chart boundary (NE Axel Heiberg I.)	n/a