

**POLAR BEAR MANAGEMENT
MEMORANDUM OF UNDERSTANDING**

BETWEEN

**Qikiqtarjuaq
Nativak Hunters' and Trappers' Organization**

**Clyde River
Namautaq Hunters' and Trappers' Organization**

**Pond Inlet
Mittimatalik Hunters' and Trappers' Organization**

Qikiqtaaluk Wildlife Board

and

The Department of Environment

**FOR THE MANAGEMENT OF THE
"BAFFIN BAY" POLAR BEAR POPULATION**

March 9, 2005

The following Polar bear Management Memorandum of Understanding (MOU) recognizes and respects both the Agreement between the Inuit of the Nunavut Settlement Area and her majesty the Queen in Right of Canada (The Nunavut Land Claims Agreement or NLCA), and the jurisdiction of the Nunavut Wildlife Management Board (NWMB) under the NLCA. Accordingly, this MOU shall, where appropriate, constitute recommendations for consideration by the NWMB.

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MEMORANDUM OF UNDERSTANDING FOR THE MANAGEMENT OF THE BAFFIN BAY POLAR BEAR POPULATION

Section 1.0

Definitions/Assumptions

- 1.1 The species considered in this Memorandum of Understanding (MOU) is the polar bear (*Ursus maritimus*).
- 1.2 The polar bear population covered by this MOU is the Baffin Bay Polar Bear Population, hereafter referred to as (BB) as shown in the map in Appendix 1. However, this MOU is for polar bear management practices within the (BB) population boundaries and the Nunavut Territorial borders only.
- 1.3 Outpost camps associated with a community, and not having organized their own Hunters' and Trappers' Organization (HTO), are considered part of the local HTO and party to this MOU.
- 1.4 "Conservative Harvest Rate" means the number of bears that can be taken per year with not more than 10% risk of a population decline that would require more than 5 years of harvest moratorium to recover to the current number over a 15-year period starting from the most recent population inventory. It is recognized that the population is expected to grow when harvested at the "Conservative Harvest Rate".
- 1.5 "Guided Harvest Rate" means the number of bears that can be taken without reducing the population below the target number. The "Guided Harvest Rate" is based on Inuit Qaujimajatuqangit (IQ), perception of trend, and probability of increase or decline. The "Guided Harvest Rate" must be consistent with the principles of conservation identified in the Nunavut Land Claim Agreement (NLCA).
- 1.6 "Total Allowable Harvest" (TAH) for the (BB) polar bear population means the number of polar bears that can be harvested annually at a sex ratio of 2 males per 1 female as established by the NWMB pursuant to Sections 5.6.16 to 5.6.18. For clarity (see also Section 1.10), the TAH identified in this MOU serves as a recommendation to the NWMB, and is understood to come into effect only after it is approved as a decision by the NWMB.
- 1.7 "Credit" is that part of an HTO's share of the TAH that is not harvested in the year it is allocated.
- 1.8 "Flexible Quota System" is protocol for ensuring that the kill of both males and females remains within the TAH for each sex.

- 1.9 "Target Number" is the management goal for the population size of the (BB) population.
- 1.10 This MOU supersedes any previous polar bear management agreement for the (BB) population, and will come into effect after it has been reviewed and accepted by the Nunavut Wildlife Management Board (NWMB).
- 1.11 The terms and conditions of this MOU will not be changed without the consent of all the signatories. This MOU may be reviewed anytime there is new information or a management issue. If one of the signatories wishes to revisit some aspect of the MOU, they shall provide notification to all other parties, and allow 90 days for a response. Once all the signatories have agreed to an amendment, it will come into effect after it has been reviewed and accepted by the NWMB.
- 1.12 For the purpose of this MOU, a Nunavut beneficiary shall be considered to include any person who has received an assignment of rights to hunt polar bears and any person who has been designated as an Inuk as per the NLCA. For greater certainty, a person assigned a share of the polar bear TAH under the NLCA section 5.7.34(b) is not to be considered an Inuk under the NLCA unless the person is an Inuk under the NLCA.

Section 2.0

Objectives

- 2.1 To manage polar bears to simultaneously maximize benefits to beneficiaries of the NLCA; safeguard the interests of future generations of hunters; and ensure good conservation of polar bears by keeping the risk of population decline due to over-harvest within the acceptable level in accordance with the best information available, including comprehensive harvest statistics.
- 2.2 To encourage the collection of Inuit Qaujimajatuqangit and scientific information on a timely basis to guide management decisions.
- 2.3 To ensure that the (BB) polar bear population remains abundant and productive. The target number for the polar bear population of the (BB) population is (2074).
- 2.4 To identify a management approach that meet the needs and preferences of the hunters that harvest polar bears from the (BB) population and is also consistent with the NLCA and the Wildlife Act.
- 2.5 To conserve female polar bears in order to mitigate the impact of harvesting on the (BB) population, and encourage the number of polar bears in the (BB) population to

attain and retain the target number. This requires harvesting the TAH at 2 or more males per female taken. It is recognized that it would be to the benefit of the (BB) population to keep the proportion of males harvested as high as possible.

- 2.6 To minimize detrimental effects of human activities, especially commercial activities, to the polar bears and polar bear habitat of the (BB) population.
- 2.7 To encourage the wise use of polar bears and all polar bear products of the (BB) population.
- 2.8 To identify research priorities and ensure participation of local people in research activities and the collection of harvest data for the (BB) population.
- 2.9 To hold management meetings with representatives of the parties to this MOU at least once every 7 years to review and update information and set direction for the continuing management of polar bears.

Section 3.0

Hunters' and Trappers' Organization (HTO) Determinations

- 3.1 As per the NLCA, the HTO may develop rules for non-quota limitations and manage harvesting among members.
- 3.2 Within one year of the signing of the MOU, the HTO will develop and record its rules for harvesting polar bears. Such HTO rules only require formal NWMB approval to be valid if they are inconsistent or in conflict with:
 - i) existing provisions of the MOU that constitute plans for the management or protection of polar bears or their habitats, or
 - ii) TAH, non quota limitations or TAH rules established by the NWMB.

Once these rules have been approved at a meeting of the members (e.g., an Annual General Meeting) and, if necessary by the NWMB. The rules will be considered to be part of this MOU and will be recorded in Appendix 4. Community HTO Polar Bear Hunting Rules. As a courtesy, the HTO shall inform the Dept of Environment and the NWMB of any new rules or amendments to existing rules.

- 3.3 The HTO will interpret and enforce these rules as internal business, but the rules will not be part of the regulations.
- 3.4 The polar bear harvest year shall be from July 1 to June 30 of each year. The HTO shall open and close their polar bear hunting season as they choose to optimize polar bear hunting for their community.

Section 4.0

Regional Wildlife Organization (RWO) Determinations

- 4.1 The relevant RWO will have the authority to distribute any accumulated harvest credits as required to cover accidental, defence, or illegal kills. The RWO may also return credits annually to augment a community's harvest. Credits may not be transferred between communities that share a population without the written consent of the community that accumulated the credit.
- 4.2 DOE shall support the RWO by maintaining an up to date record of the harvest credits. DOE will provide the RWO a summary of the harvest credits as part of the annual harvest report by July 1st each year. For clarity, the available credits will be automatically allocated to retain the full TAH for each community. The RWO shall provide DOE with their decisions on credit allocations and DSD shall retain and archive all administrative records. The full administrative records for harvest credits shall be available for the RWO on request. DOE shall advise the RWO as requested on the optimal allocation of credits to maximize harvest opportunities for Nunavut beneficiaries.

Section 5.0

Regulations

5.1 Definitions

- 5.1.1 "Cub" means a young polar bear that is less than one year of age.
- 5.1.2 "Yearling polar bear" means a polar bear that is older than one year of age, but less than two years of age and is still with its mother.
- 5.1.3 "Two-year old" means a polar bear that is two years of age or older, but less than 3 years of age, and is still with its mother.
- 5.1.4 "Family group" means a group of polar bears that consists of a mother with a cub/cubs, a mother with a yearling/yearlings, or a mother with a two-year old/olds.

5.2 Evidence Age/Sex

- 5.2.1 The parts that evidence the age, species, and sex of a polar bear are teeth for the age; the jaw or skull for the species; and the baculum of the male polar bear for the sex. When the baculum has been lost or forgotten the DNA determination shall

also constitute evidence of the sex. Where evidence is not provided, the kill will be counted as a female polar bear for TAH purposes.

- 5.2.2 It is recognized from traditional knowledge that polar bear cubs are born in November and December. The age of a cub will be determined by the degree of canine tooth eruption for cubs, and the annular rings for cubs, yearlings, and two-year olds when the skull, jaw or a tooth is present.

5.3 Prohibitions

- 5.3.1 No person shall hunt:

- (a) Any member of a family group. If the female of a family group of cubs, yearlings, or two-year olds is killed, the cubs, yearlings, and two-year olds will be regarded as killed as well.
- (b) A female polar bear that is using a den, or a female polar bear that is constructing a den.

5.4 Harvesting of Cubs and Yearlings

- 5.4.1 All polar bears that are not members of a family group (i.e., are by themselves) may be harvested. If a cub or yearling is found without its mother, it may be harvested, but it must be reported to the Wildlife Officer and the HTO as soon as possible.

- 5.4.2 The HTO may apply to the Minister for a Wildlife Management Permit to allow cubs or yearlings to be harvested for food and cultural purposes. The permit must be issued in advance with a copy to the Wildlife Officer, and the HTO must monitor the hunt to ensure that the female (mother) is not harmed.

5.5 Total Allowable Harvest (TAH)

- 5.5.1 (a) Determination of the TAH

For the first seven (7) years following an accurate population inventory, the TAH shall be set as the "Conservative Harvest Rate".

For the next seven (7) years, or until a new population inventory has been completed, the TAH shall be set as the "Guided Harvest Rate".

When there is no reliable population inventory information, the TAH shall be set as the "Guided Harvest Rate".

Table 1:

The numbers attributed to Nunavut communities and any jurisdictions that share the (BB) polar bear population indicate the respective share of the Total Allowable Harvest (TAH) that is allocated to each community or jurisdiction that harvests from the (BB) population. These values represent the basic annual allocation of the TAH to the community. The actual number of tags received in any given year to Nunavut communities will not exceed this number (unless the RWO allocates credits from previous years), but may be decreased as required for over-harvest of males or females in any given year as per the Nunavut Flexible Quota System described in Appendix 2.

Allocations of the TAH (123-130) from the (BB) population (N=2100)		
NUNAVUT	TAH	TOTAL
Clyde River	21 + 24	45
Pond Inlet	22 + 8	30
Qikiqtarjuaq	21 + 9	30
subtotal	64 + 41	105
OTHER JURISDICTION		
Greenland	18-25	18-25
subtotal	18 - 25	18 - 25
TOTAL (BB)	123 - 130	123 - 130

- 5.5.2 Tags issued for the (BB) population may be used within the geographical area defined for this population and up to 30 km (17 miles) outside of the boundary after agreement has been reached with HTOs that are signatory to the polar bear management MOU in the adjoining populations.
- 5.5.3 Tags issued for Polar Bear Populations that border the (BB) population may be used up to 30 km (17 miles) inside of the (BB) population.
- 5.5.4 The 30 km (17 miles) rule does not apply to inter-jurisdictional borders unless there is a cross-boundary overlap agreement; it only applies to populations within the Nunavut Territory.
- 5.5.5 Unused tags will not be carried over for use in a subsequent hunting season. After June 30th, all unused tags will be turned over to the DSD. These returned tags will be counted as credits to the community and administered by the appropriate RWO.

5.6 Specimens/Information

5.6.1 The following shall be collected from each polar bear killed:

- (a) Lower jaw;
- (b) Ear tags, if present;
- (c) Lip tattoos, if present;
- (d) Evidence of sex (baculum), or as per Section 5.2.1, from all male polar bears;
- (e) Any other polar bear specimens as agreed by the HTO or individual hunter for any additional studies. For clarity, this stipulation means that this MOU constitutes HTO support for the use of the polar bear specimens referred to in subsection 5.6.1(a) to (e) for Dept. of Environment research studies.

NOTE: The specimens identified in 5.6.1 (a,b,c,and d) are mandatory, however they can be returned if requested by the hunter. Returned specimens will be sent within 6 months of being received by the laboratory. If a polar bear with a radio collar is taken, the radio collar will be turned in to the local HTO for return to the research project. Any damage to the meat or hide from polar bear research activities will be compensated for by the research project as per Section 5.6.4.

5.6.2 The DOE agrees to compensate hunters for their work to collect and label the required specimens at the following rates:

- | | | |
|-----|---------------------|----------|
| (a) | Lower jaw or skull: | \$45.00 |
| (b) | Ear tags: | \$30.00 |
| (c) | Lip tattoos: | \$40.00 |
| (d) | Baculum: | \$100.00 |

5.6.3 The hunter is required to provide the following data, which are recorded for each polar bear killed:

- (a) Hunters name and full address including country;
- (b) Date of kill;
- (c) Location of kill;
- (d) Sex;
- (e) Tag number; and
- (f) Any other information that is required by the Wildlife Officer.

5.6.4 Any damage to the hide from research activities will be compensated for based on the reduced amount of the hide's market value. When the meat has been made unfit for human consumption by chemical immobilization within one year of the date of harvest, \$300.00 compensation will be paid to the hunter who harvested the polar bear.

- 5.6.5 The DOE will provide an annual report of population and community harvest statistics, and recommendations for the next year's TAH, by July 1st of each year for the HTOs and RWOs to review and to assist the NWMB in setting TAH for the following year.

5.7 Response to Population Depletion

- 5.7.1 This agreement recognizes that the estimates of population numbers, birth and death rates, and acceptable harvest levels are uncertain. For that reason there is a small chance that the population will decline. The DOE intends to conduct a population inventory every 15 years. If the new research indicates that the population has declined below 90% of the target number for any reason, a moratorium on harvesting will be implemented until the population is projected to have recovered, or until a new population estimate shows that it has recovered to its target number. If the new research indicates that the population has declined by no more than 10% of the target number for any reason, a reduction in TAH will be implemented that is projected to be sufficient to allow the population to recover to the target number in 15 years or less.

5.8 Development of Regulations

- 5.8.1 The DOE will develop the wildlife regulations required to implement this MOU.

Section 6.0

Application of Tags to Total Allowable Harvest

(Administration of the Flexible Quota System)

- 6.1 All human caused polar bear kills will be taken from the TAH of the nearest community, or from a community within the (BB) population with unused tags, if that community agrees. In the event that the human caused mortality exceeds the TAH, additional tags will be issued and the number of additional tags issued will be deducted and counted as part of the next year's TAH. A naturally abandoned cub or yearling will be counted as a natural death. Polar bear cubs caught in traps and/or netting set for other species shall be recorded as part of the human kill. For TAH determination purposes, the cubs will be counted as males, and will require one half tag each.
- 6.2 When a Nunavut beneficiary residing in a BB population community kills a bear in the BB population, the tag will come from their home community. If his/her home community has utilized all of its tags, the tag may be used from any

- available credits; or another (BB) population community with their consent. If the kill is accidental, illegal, or is carried out in defence and no tags or credits are available from the home community or provided by another BB population community a tag must be taken from next years TAH of the home community.
- 6.3 When a female with accompanying cubs, yearlings, or two-year olds is killed in the defence of life or property, the cubs, yearlings, and two year olds are also regarded as killed (removed from the population). For TAH determination purposes, the cubs and yearlings will be counted as males, and require only half tag for each cub. The two-year olds will receive a full tag and be counted as their actual sex if killed, or one-half male and one-half female if they are not killed.
- 6.4 The number of TAH tags allocated in a given year depends on the communities share of the (BB) population's acceptable annual harvest rate of both males and females, the actual number of males and females killed in the previous year, and the proportion of females in the total harvest in the previous year. The Nunavut Flexible Quota System determines the TAH for the current year as described in Appendix 2.
- 6.5 The implementation of the Nunavut Flexible Quota System will consider the current polar bear harvest credits (see Appendix 2). As per Appendix 2, no reductions in TAH will occur unless there are no polar bear harvest credits available to address the over-harvest. Unharvested males and females are considered as credits to address any problems resulting from over-harvest of males or females in a particular year, or can be allocated in future years. In the case of one-half tag reductions to the TAH (i.e., cubs and yearlings that were still with their mother or cubs caught in traps set for other species), no TAH reductions will be made until a whole tag (i.e., one full tag) reduction is required.
- 6.6 Community credits shall be used to cover defence, illegal, or accidental kills before the community TAH is reduced. The appropriate RWO will take the final decision after a review of the HTO request and a summary of the incident has been provided by the community Wildlife Officer.
- 6.7 The complete rules for administration of the Nunavut Flexible Quota System are contained in Appendix 2. The regulations will not be modified year by year, rather the polar bear TAH for a given year will be determined based on the Flexible Quota System described above and in Appendix 2.
- 6.8 Any person finding a dead polar bear should report the bear to the nearest HTO or Wildlife Officer, and if the hide or any parts have been taken, they shall be turned over to the Wildlife Officer for investigation. When the investigation is complete and it is concluded that the death was by natural causes, the hide and all parts of the bear will be returned to the nearest HTO, and it will not be counted against the

TAH. The existing certification of wildlife regulations will apply to all natural kills. If the specimens identified in Section 5.6.1 are collected, the person shall be compensated according to Section 5.6.2 by the DOE.

- 6.9 The TAH will not be reduced in future years just because the full TAH is not taken in any given year. Unused tags will be recorded as credits and can be reallocated in subsequent years at the discretion of the appropriate RWO.

Section 7.0

Research and Management

- 7.1 The intention of DOE is to conduct population inventory studies every 15 years to determine the numbers, and rates of birth and death for the (BB) population. Harvest statistics will continue to be collected. The results of these studies will guide future management of this population. The intended date to begin the next (BB) population inventory is 2013 (open water season).
- 7.2 Community residents (priority to HTO members) shall have the opportunity to participate in polar bear research projects.
- 7.3 This MOU shall constitute consultation and support for the periodic polar bear population inventory studies identified in Section 7.1. These studies shall be done in partnership with the relevant HTOs and RWOs.
- 7.4 When a tooth referred to in Section 5.2.1 is not available for the purpose of determining the age, the age of a cub shall be determined by expert testimony (i.e., Qaujimanilik) if there is any question.
- 7.5 When tag is used for a defence or accidental kill by a non-Nunavut beneficiary, it reduces polar bear harvest opportunities for Nunavut beneficiaries who have been identified as requiring the TAH in Article 5.6.5 of the NLCA. Compensation for that loss is required from the party whose activities caused the destruction of the bear. The parties of this MOU call upon the NWMB as the primary instrument of wildlife management to identify the most appropriate administrative process to ensure that communities that lose tags to non-beneficiary polar bear kills are fairly compensated.
- (a) All polar bears killed in or during polar bear research activities or DOE approved activities (i.e., research permit issued) will receive a tag from the nearest community and the community will be compensated at \$5,000.00.
- (b) Currently the direction of the NWMB and the RWOs is that the hide, meat, and all parts from emergency kills (i.e., accidental, defence, or research kill)

will be returned to the HTO. When there is an irregular kill, the investigating officer will seize the parts of the bear necessary to complete the investigation. The specimens identified in Section 5.6.1 shall be collected and the DOE shall provide compensation to the HTO as per Section 5.6.2. When it has been determined that the kill was an accidental, defence, or research kill, the Wildlife Officer shall ensure that all seized parts from that kill shall be turned over to the local HTO. The cleaning and drying of the hide will be arranged and paid by the HTO because the HTO shall retain the hide.

- (c) If there is any dispute on the disposition of the hide, meat, or parts of the bear from an emergency kill, the decision on the disposition of all bear parts is deferred to the appropriate RWO.
- (d) There shall be no payment to the HTO or the hunter for specimens, or for cleaning and drying the hide of a bear taken illegally. As per the Wildlife Act, all seized parts from bears taken illegally shall be disposed of as directed by the appropriate judicial authority.

7.6 HTOs and the DOE will:

- (a) Research and develop better methods to:
 - i) Deter problem bears,
 - ii) Prevent polar bear damage to property,
 - iii) Prevent loss of meat caches to polar bears. and
 - (b) Work co-operatively with all jurisdictions that share this population to reduce human impacts from research, tourism, and problem bear control activities.
- 7.7 Within one year from the signing of this document, the DOE will ensure that a community based polar bear deterrent plan had been formulated and implemented.
- 7.8 The terms and conditions of this MOU will also apply on lands within National Parks, Federal Bird Sanctuaries, and National Wildlife Areas.
- 7.9 If a bear is found that is near death from natural causes, and will not recover, a hunter may take this bear as a humane action. The Wildlife Officer will require the carcass and the hide from the hunter for purposes of conducting an investigation to determine if it was a humane kill. A humane kill will be considered a natural death and will not be taken off the TAH, and the hide and all parts will go to the HTO after the Wildlife Officer has seized the hide and carcass and completed the investigation.
- 7.10 The HTO may, at their discretion, use a portion of the community TAH for sport hunting. The DOE will assist any HTO that wishes to develop polar bear sport hunts for their community.

- 7.11 A polar bear co-management agreement should be developed that includes all jurisdictions that harvest from the (BB) population.
- 7.12 Inuit Qaujimajatuqangit (IQ) will be incorporated in polar bear management.
- (a) The rules established by the HTO to regulate local hunting practices will reflect the wisdom, spirit and information of IQ.
 - (b) It is recognized that information about denning areas, feeding areas, season concentration areas, behaviour, and the general ecology of polar bears is held collectively by the Inuit, but much of this information has not become a part of the scientific information. The DOE will support and endeavour to collect and archive the information relevant to conservation and public safety.
 - (c) Recognizing that information about polar bear population demography (i.e., analysis of the standing age distribution and mark-recapture data) and population boundaries (i.e., observations of the movements of marked bears and radio collared bears) is not a part of IQ, and recognizing that IQ is a living and evolving knowledge system. The scientific information on population dynamics and population boundaries will be transferred by improved communications, and by ensuring participation of local people in research projects and management decisions. The goal is that one day all the information about polar bears will be held in common as science, TEK, and IQ.

Section 8.0
Baffin Bay Population Signature Block

x _____ date: _____
Koalie Kooneeliusie
Chairman
Nativak Hunters' and Trappers' Organization (Qikiqtarjuaq)

x _____ date: _____
James Qillaq
Chairman
Namautaq Hunters' and Trappers' Organization (Clyde River)

x _____ date: _____
Jayko Alooooloo
Chairman
Mittimatalik Hunters' and Trappers' Organization (Pond Inlet)

x _____ date: _____
Joannie Ikkidluak
President
Qikiqtaaluk Wildlife Board

x _____ date: _____
Olayuk Akesuk
Minister
Department of Environment
Government of the Nunavut Territory

Appendix 1.
BAFFIN BAY (BB) Polar Bear Population

Boundary was based on the movements of satellite radio-collared polar bears, mark-recapture movements, and guided by the hunting practices and information of local people.

Appendix 2.

Rationale and Administration of the Flexible Quota System

INTRODUCTION

The flexible quota system for polar bears assumes that the annual maximum sustainable yield of males and females for a given population has been divided between the communities that share that population. Each community receives its share of the maximum sustainable harvest of males and females as an annual baseline allocation. For polar bears, the maximum harvest that can be sustained is realized when the harvest is 2 males for every female. However, not every community can harvest exactly 2 males per female every year. In some years, the full allocation may not be taken. In other years the kill may exceed the annual base allocation of males or females. The flexible quota calculation takes into account:

- 1) Any "credits" from previous years when not all the bears were harvested,
- 2) The total number of males killed or removed from the population, and;
- 3) The total number of females killed or removed from the population.

ADMINISTRATION / ACCOUNTING

The flexible quota system is nothing more than system for administering the portion of the total population maximum sustainable yield that has been allocated to a given community. First the sustainable yield of males and females for a given population must be identified. Next the total sustainable yield must be divided among the communities that share a given population. Then the base annual allocation for each community is established and the flexible quota system is used to adjust the TAH as required to keep the kill within sustainable limits.

Simulation modelling has shown that, for polar bear populations about twice as many males as females can be harvested. The sustainable number of females is defined as the number that can be removed without causing a decline in the number of females in the population. However, it is different for the males. Because the males do not produce the cubs, twice as many can be taken. A 2M:1F harvest sex ratio does reduce the number of males in the population to about 70% of the number that would be present if the harvest was unselective. The mean age of the males in the population is also reduced by about 2 years. However, this has the effect of focusing the harvest on younger males in the more abundant age classes. We assume that the females can still find mates and that younger bears mate just as successfully as older bears. The available data support this. There is no evidence of diminished reproduction, even in populations where it is clear that over-harvesting has depleted the males. Males are reproductively mature by the time they are 4-5 years old, and on average females are only available to mate every two years because of extended parental care.

The annual base allocation value is an annual allotment that does not vary. However, if a community over-harvests either males or females in a given year, that over-harvest must be compensated for by reducing the annual actual allocation. The actual allocation is reduced two ways. The first way is a simple numerical reduction to "pay back" the over-harvested males or females. The second is that if the females are over-harvested, then the community has shown it cannot harvest at a 2M:1F sex ratio. The current allocation for females always gives the maximum number of females that can be taken. However, when an over-harvest of females has occurred in the previous year, the current allocation for males is based on both:

- 1) The current allocation of females, and
- 2) The actual proportion of females in the harvest (P_F).

The current allocation of males is determined by the equation for calculating the sex ratio:
 $P_F = \# \text{ Females} / \# \text{ Males}$

$$\# \text{ Males} = \# \text{ Females} / P_F$$

The value of P_F cannot be less than 0.33 or the take of males would be too large (unsustainable). For that reason, if the actual P_F value is less than 0.33, we still use 0.33. If the actual value of P_F is greater than 0.33, the actual value is used.

The actual sex ratio is only taken into consideration when the kill of females has exceeded the sustainable number (i.e., the actual allocation for that year). This is to avoid penalizing a community that shuts down the harvest when the last female has been taken. It is the number of bears taken that really matters. The proportion of females in the harvest is only an indication of what the sex ratio for the next year will be. As long as a community has not exceeded the allowable kill of males or females, there is no reduction in TAH, regardless of the sex ratio of the kill.

Credit is given for any unused current allocation of males and females. The credits can be either male or female. Credits are specific for a given population and cannot be used for other populations. Credits belong to the community that did not fully utilize its actual allocation. A community can use its credits to compensate for over-harvest in a given year. Also, credits can be provided to other communities that share a given population if both communities agree. The community that has over-harvested must request the credit of the appropriate sex from a community that has such credits. If a female credit is requested, a male credit must be exchanged because there cannot be more negative male credits than positive female credits. It is sustainable to over-harvest the males as long as an equivalent number of females are also under-harvested. As long as there is at least one positive female credit for each negative male credit, there is no reduction to the TAH. This means that as long as the total TAH is not exceeded, and as long as the females are not over-harvested, the TAH for the following year will stay at the maximum base allocation.

Credits are a special case because they represent individuals that were not taken, so they are in addition to the estimated population. Credits are administered separately. There is an assumed loss rate of 4% per year for male credits because 4% is the natural mortality rate. There is an assumed increase of 3% per year for female credits because that is the zero-harvest natural population growth rate. Females produce both males and female offspring so the female increase of 3% per year also applies to the males. However, the male increment is 3% times the number of females since it is the females that produce the cubs. Credits accumulate until the next population inventory, and then they are zeroed because the total population is taken into effect when the new TAH is determined. When the credits are not used, the population will increase allowing larger quotas for future generations.

The rules for how the kill is counted are given in the polar bear MOU for each population are also listed above. They are repeated here using slightly different language:

1. All human caused mortality to polar bears will be taken from the TAH of the nearest community. In the event that the human caused mortality exceeds the TAH, extra tags will be issued, and the TAH for the following year will be correspondingly reduced as per the flexible quota system.
2. A naturally abandoned cub will be counted as a natural death and not counted against the TAH.
3. Any bear that is found near death can be killed as a humane action and, once the Wildlife Officer has certified that the bear was near death, the humane kill will not be counted against the TAH.
4. When a Nunavut beneficiary kills a bear, the tag will come from that person's home community if that community has a TAH in the population that the bear was harvested from. Otherwise, the nearest community must provide the tag.
5. When a female with cubs, yearlings, or juveniles is killed; the cubs, yearlings and juveniles are also regarded as killed (even if they run away). For TAH determination purposes, the cubs and yearlings are counted as all males and only $\frac{1}{2}$ tag each. The juveniles are counted as whole tags of whatever sex they are. If the cubs run away after the female is killed, the cubs are counted as $\frac{1}{2}$ tag and all male, however the yearlings and the juveniles are counted as whole tags for each, and the sex is counted as $\frac{1}{2}$ male and $\frac{1}{2}$ female.

6. The credits are available to address all types of kills, including accidental, illegal, and defence kills.
7. If a community shuts down it's harvest after exceeding the maximum allowable females, the unused tags are counted as harvested males **for calculating the proportion of females only** so as not to penalize the community for shutting down the harvest before filling all the tags. If a community does not exceed the current allocation for females, for TAH calculation purposes the harvest sex ratio is assumed to be 0.33 (i.e., 2M:1F).
8. The community credits accumulate until the next population inventory results are final. Then all credits are set back to zero because the new TAH is based on the new population information, and all of the sustainable take is allocated as the new TAH. Any credits will be realized as TAH increases if the population information was accurate and the credits are not used. The communities then resume collecting credits from the new start, as before.
9. Each year male credits are reduced by 4% per male because of natural mortality. Each year female credits are increased 3% per female and male credits are increased 3% per female because of the natural (no-harvest) population growth rate.

Here is an example to show how the calculations are made:

The flexible quota system has been in use since 1996, and is well tested. The lessons learned have been incorporated into the new computer program, and hopefully the more fully developed system will be sufficient for all cases.

The 1999/2000 Coral Harbor harvest is a good example of the general principles.

The base allocation is 26 males and 13 females.

The allocation for 1999/2000 was 26 males and 13 females.

The credits going into the harvest year were 8.67 males and 2.33 females.

The kill for 1999/2000 was 21.5 males and 16 females.

The first step was to deal with the over-harvest of the females.

There were 2.33 credits to cover the over-harvest of 3 females.

That left 0.67 female over harvest to be covered from the next year's allocation of 13 females.

$13 - 0.67 = 12.33$ as the 2000/2001 allocation of females.

Next the TAH for 2000/2001 has to be determined.

The females are known (12.33), so it is a matter of determining the total number of tags that can be allocated without exceeding the sustained yield of females (12.33) and males (26) for the 2000/2001 harvest season.

When the kill of females exceeds the sustained yield and the credits are not sufficient to cover the over-harvest, the TAH for the next year is calculated using the actual sex ratio of the harvest rather than the 0.33, which was exceeded. The reason for this is to avoid allocating too many tags causing an even larger over-harvest of females the next year.

The actual sex ratio was $13/37.5 = 0.34666$.

However, we the community did not fill all of it's tags. If the full 39 had been killed, and the last 1.5 had been males ... the sex ratio would have been better. We do not want to penalize the community for stopping the harvest as a conservation measure, so we assume the unused tags were males for the purpose of calculating the sex ratio. This is not in the MOUs, but it gives communities that stop harvesting the benefit of the doubt as an incentive to STOP HARVESTING once the last female has been taken.

The effective sex ratio is $16/39 = 0.41025$.

The TAH for next year is based on the following relationship:

Maximum Females Taken = TAH * Proportion Females

We know the Maximum Females Taken = 12.33

We know the sex ratio from last year was 0.41025

The TAH is given by:

$$\begin{aligned}\text{TAH} &= \text{Maximum Females Taken} / \text{Proportion Females} \\ &= 12.33 / 0.41025 \\ &= 30.05\end{aligned}$$

By convention we round up the total to 31 with a recommendation that the kill not exceed 12 females and 19 males.

We keep track of all the fractions so the communities always get their full allocation and full credits. However, the recommended tags are always whole numbers that, if followed, will result in the full TAH for next year.

IMPORTANT: The sex ratio consideration is only implemented when the kill of females exceeds the available allocation and credits. That means that if Coral could obtain a transfer

of 0.67 females credit from some other Western Hudson Population community, they would receive their full TAH of 39. They are being reduced both by number of females allowed AND by the 0.41025 sex ratio. However, Coral should be warned that the larger TAH also increases the risk of over-harvesting females.

The credits for males and females are based on the base allocation and actual kill. In most cases a reduced TAH is because of an over-harvest problem with females, and that is why the male credits seem to accumulate more than female credits. When the total TAH is reduced because of over-harvest of females and failure to harvest at the 2M:1F sex ratio, the determination of male credits is based on the base allocation provided there was no over-harvest of males the previous year. Thus the full credits from the estimated maximum sustained yield are correctly accounted for.

Here is a final simple recommendation that will prevent any reductions in the TAH from the flexible quota system: **Stop hunting when the last female is taken.**

If there are any difficulties in using or understanding this program or the counting rules, please contact your local Wildlife Officer, or the Polar Bear Biologist.

Appendix 3.

Harvest Risk Management Protocol

Management decisions on polar bears are guided by the information available. One of the most important management decisions is the number of males and the number of females that can be harvested. Because the TAH is a number, the decision is based mainly on the quantitative data on polar bear population demography (population number and natural rates of birth and death). However, the demographic information is not always available for each population. Even when the demographic information is available it is not perfect, it is uncertain. Research programs that provide the demographic estimates also provide a measure of the uncertainty of the estimates produced by the study.

There are two ways that the demographic data can be “checked”. The first is to see if the estimates make sense. If the natural rates of birth and death would not sustain a polar bear population even if there were no harvest, then they are probably not correct. If the population estimate suggests that the current harvest would be reducing the population, but the population is known to be extending its range and increasing its numbers, then the population estimate is probably not correct. These qualitative “reality checks” are useful to avoid serious management mistakes, but do not provide the necessary quantitative information for a sound decision on the TAH.

Even when the full demographic information has been collected, and the parameters seem to make sense; the variance of the estimates of birth and death and population numbers (i.e., variance) document that these estimates are not exact, but rather have varying degrees of uncertainty. A variance estimate is a measure of how much the parameter might be off. This kind of uncertainty is quantitative, and we can accommodate it.

Our population inventory programs provide good estimates of demographic parameters. We then use the computer to simulate the future under many, many scenarios. Each scenario is a “what if” run. Each run takes a different set of parameter values that are based on the variance estimates. This method of exploring different outcomes based on the uncertainty of the main factors is called the Monte Carlo method. When it is applied this way it is also sometimes called Population Viability Analysis or a Bayesian probability estimate.

Most times population viability analysis is concerned with avoiding reducing the population so much that it goes extinct. In our case, we want to avoid reducing the population below levels that would be “unacceptable”. By “unacceptable”, we mean reductions that would require a long time for the population to recover. The decision of what constitutes “unacceptable” is subjective, and would be identified through consultations with hunters and Nunavut’s co-management process. Even after the unacceptable level of reduction has been agreed and accepted, there is always some risk that the population may decline to a value less than the agreed level. The co-management authorities must also agree on the acceptable level of risk that there is a reduction worse than the one judged to be acceptable.

Our recommendation for large and productive populations is that the harvest and total kill be limited to a number that gives 90% certainty that the population will not decline to a level that would take more than 5 years to recover. When independent information provides a strong reason to believe that the population can sustain a larger harvest, a minimum of 80% certainty can be tolerated. The certainty estimates require a population inventory cycle of not longer than 15 years. When the information on the population is very uncertain, fewer bears can be harvested. This means that there is value to the community (larger TAH) for good information. It also means that if the information is dated and suspect, as it is for many of Nunavut's polar bear populations, that the TAH will be reduced as a result. Both conservation polar bears and TAH are enhanced by good information, and compromised by poor information.

When there is no commitment for a population inventory cycle, or the population has such low numbers that it is not cost-effective to maintain a periodic inventory schedule, a more conservative harvest management is required. The criteria for these populations will be 95% certainty that the population will not decline to a level that would take more than 5 years to recover over a 75-year time interval. If monitoring of these small populations can occur more frequently, these criteria can be relaxed accordingly.

A final issue is that many of Nunavut's polar bear populations are shared with other jurisdictions. There is little value in reducing Nunavut TAHs if other jurisdictions that share polar bear populations with us continue to over-harvest polar bears and refuse to accept their financial obligations for the population inventory cycle. An essential component to risk management is that it must be accepted and implemented over the entire range of the population to be fair and effective.

This harvest policy commits the GN to a polar bear research program sufficient to conducting a population inventory of its large populations every 15 years. There must also be a comprehensive harvest collection program, and inter-jurisdictional agreements between Nunavut to participate in and cost-share the inventory and harvest monitoring programs for shared populations.

Appendix 4

Community Polar Bear Hunting Rules

Appendix 5

**Summary of the Roles and Responsibilities of the Co-management Partners for Polar Bear
Conservation as per this MOU**

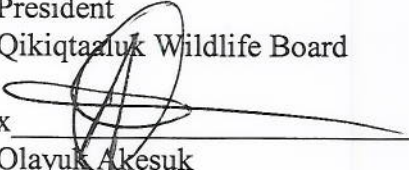
Section 8.0
Baffin Bay Population Signature Block

x _____ date: _____
Koalie Kooneeliusie
Chairman
Nativak Hunters' and Trappers' Organization (Qikiqtarjuaq)

x _____ date: _____
James Qillaq
Chairman
Namautaq Hunters' and Trappers' Organization (Clyde River)

x _____ date: _____
Jayko Alooloo
Chairman
Mittimatalik Hunters' and Trappers' Organization (Pond Inlet)

x _____ date: _____
Joannie Ikkidluak
President
Qikiqtazuk Wildlife Board

x _____ date: _____

Olayuk Akesuk
Minister
Department of Environment
Government of the Nunavut Territory

Baffin Bay Population

x [Signature]
Koalie Mooneelusic
Chairman
Nativak Hunters' and Trappers' Organization (Qikiqtarjuaq)

date: May 11/04

x [Signature]
James Qillaq
Chairman
Manautaq Hunters' and Trappers' Organization (Clyde River)

date: May 10/04

x [Signature]
Joannie Ikkidluak
President
Qikiqtaaluk Wildlife Board

date: _____

x [Signature]
James Akeeloo
Chairman
Mittimatalik Hunters' and Trappers' Organization (Pond Inlet)

date: 06/05/04

x _____
Olayuk Akesuk
Minister
Department of Sustainable Development
Government of the Nunavut Territory

