2010 Nunavut Research Licence Renewal Application: Wayne Pollard

Research Licence # 0200909R-M (multi-year)

Project Title: The permafrost hydrology and environmental significance of perennial springs in the Expedition Fiord area, Axel Heiberg Island

Project Leader: Wayne Pollard, McGill University,

2010 Research Team: Miles Ecclestone (Trent U.), Marco Zentilli (Dalhousie U.), Sarah Hall (McGill) Laura Thompson (U. Western Ontario) and 1 student field assistant.

2010 Fieldwork: Planned fieldwork includes a) March 26-April 16, and b) June 25-July 10.

2010 Field sites: Sites on Axel Heiberg Island, including Expedition Fiord area (79º 25'N; 90º 45'W), Strand Fiord (79º 05'N; 90º 00'W), Whitsunday Bay (79º05'N ; 87º00'W), and Bunde Fiord (81º55'N ; 79º30'W) – same sites as previous years

Funding source: Natural Science and Engineering Research Council (NSERC)

Introduction: This is an ongoing project concerned with the study of the hydrology and geomorphology of cold saline groundwater flow at several locations on Axel Heiberg Island. The primary aim of this research is to understand how cold, saline ground water interacts with the cold high Arctic environment and how it affects the surrounding landscape. Specific aims include (1) to determine the extent of this type of ground water system, (2) to determine the source and age of the ground water, (2) to understand and explain landforms and processes related to the interaction between groundwater and permafrost, and (3) to describe the microbial communities associated with springs, lakes and permafrost. Over the past few years our studies have provided new information about the limiting conditions of water and microbial life related to cold temperatures and a better understanding about landforms related to ground water. This is the only research on cold perennial springs being conducted in the high Arctic. These springs have no commercial value and our research is driven entirely by scientific questions.

Progress Report – 2009 fieldwork. Between March 25-April 20 we undertook a series of measurements of the temperature and flow rates of springs at Expedition Fiord. Because of logistical limitations we were not able to make similar measurement at our sites at Strand Fiord and Whitsunday Bay. We collected water samples to analyze for chemistry and environmental isotopes. I undertook a detailed GPS survey of the ice formations around the springs at Gypsum Hill. I collected data from our automatic weather station as well as completing our snow surveys. These data indicate that 2008 was a low snow year but fairly typical with a July maximum of + 12C and winter minimum of -52 C. Between April 7-14 we hosted 2 Ranger patrols. In late June I conducted aerial surveys of springs in other locations on Axel Heiberg Island as well as looking for new springs.

2010 Proposed Research: This year I will continue to do both winter (March-April) and summer (June-July) periods of fieldwork. The first is a 3 week field program beginning in late

March involving a small group of researchers based at the McGill Field Station at Expedition Fiord. Observations at this time of year are extremely important because it allows us to confirm the nature and pattern of ground water flow over the previous dark season. Also the frozen conditions allow us to access all of our study sites. Our work includes the characterization of saline surface flow under cold air temperatures and the formation of surface ice deposits and frost mound structures. We will collect more water samples for chemical analyses and by comparing these data with previous years we are able to better document changes hydrology and the importance of chemistry on both physical and biological systems. This research improves our understanding about the physical, chemical and biological processes occurring within these spring systems. Other field activities include subsurface mapping using ground penetrating radar, snow surveys and the collection of data from 6 automatic weather stations. In June we will continue to search for other active and relic spring sites that may exist on Axel and Ellesmere Islands. Field work will involve (a) measurement outflow temperatures, flow rates and chemistry of these spring systems, (b) sampling for microbial activity, (c) climate monitoring and (d) sampling and analysis of mineral precipitates. We will visit by helicopter sites where other springs are known to occur, including Whitsunday Bay, Strand Fiord, Middle Fiord, Bunde Fiord, Skaere Fiord and Wolf Fiord. Samples from springs, lakes, surface runoff, soils and precipitation will be collected for chemical and biological analyses. We will continue our GPS mapping of the location of spring outlets, flow paths and structures. At this time of year we repair and replace sensors on our network of automatic weather stations. We will be based as the McGill field station at Expedition Fiord. Since our work is concerned with understanding the polar environment our activities have very little or no impact.

Significance: This research strives to understand the unique nature and behaviour of the cold saline springs in the deep permafrost of Axel Heiberg Island. This research provides insights into the surface and subsurface hydrology in a region of thick, continuous permafrost and the nature of micro organisms surviving the physical and chemical extremes often found in polar environments. In addition, insight gained from my work on springs can be used to better understand how life may exist on other planets like Mars.

Translation by Susan Salluviniq, Resolute Bay

2010ᒥ ᓄᓇᕗᕐᒥ ᑭᓕᓯᐊᓂᒧᑦ ᐱᔪᓇᐅᑎᒧᑦ ᓄᑕᐅᓕᕈᑎᒧᑦ ᕿᓄᔪᑎᒃ: ᕗᐃᓐ ᐹᓗᑦ

ᑭᓕᓯᓂᐊᓂᒧᑦ ᐱᔪᓇᐅᑎᒪ ᓇᓴᐅᑖ 0200909R-M (ᐊᕐᒍᓄᑦ ᐊᒥᓱᓄᕐ)

ᐃᓕᕆᐊᕐᒪ ᑕᐃᔭᐅᓂᖓ: ᖁᐊᖑᐃᓇᕐᑐᑦ ᐃᒪᕈᖃᑕᕐᓂᖏᑦ ᐊᕙᑎᒧᓗ ᐱᒪᕆᐅᔪᑦ ᐊᕐᒍᓕᒪᕐᓗ ᑰᖃᑕᕐᑐᑦ ᐃᒃᐱᑎᓴᓐ ᓯᔭᕆᑐᕐᐸᓯᖕᒥ, ᐊᑰᓪ ᕼᐊᐃᐳᒃ ᕿᑭᑕᖓᓂ

ᐱᓕᕆᔩᑦ ᐊᐅᓚᓯᔨᖓ: ᕗᐃᓐ ᐹᓗᑦ, ᒪᑭᐅᓪ ᓯᓚᑐᕐᓴᕐᕕᔪᐊᖓ,

2010ᒥ ᑭᓕᓯᓂᐊᓂᐊᕐᑐᑦ: ᒪᐃᐅᓪᔅ ᐃᑭᓕᓯᑑᓐ (ᑐᕆᑦ ᓯᓚᑐᕐᓴᕐᕕᔪᐊᖓ), ᒫᑯ ᔨᓐᑎᓕ (ᑎᐅᓪᕼᐊᐅᓯ ᓯᓚᑐᓴᕐᕕᔪᐊᖓ) ᓯᐊᕐ ᕼᐊᐅ (ᒪᑭᐅᓪ) ᓗᐊᕐ ᑖᒻᓴᓐ (ᓯᓚᑐᓴᕕᔪᐊᖓ ᐊᑭᓇᕐᐸᓯᖓᓂ ᐊᓐᑎᐊᕆᐅ) ᐊᒪᓗ ᐊᑕᐅᓯ ᐃᑲᔪᕐᑎᐅᓂᐊᕐᑐᖅ ᑕᐸᓂ ᐃᓕᓂᐊᕐᑎ

2010ᒥ ᐱᓕᕆᓂᐊᓂᐊᕐᑐᖅ: ᐸᕐᓇᒃᓯᒪᔪᒧᑦ ᐅᑯᐊ ᐃᓚᐅᓗᑎᒃ ᐃ) ᒪᔨ 26ᒥᑦ ᐊᐃᕆᓕ 16ᒧᑦ, ᐊᒪᓗ ᐱ) ᔪᓂ 25ᒥᑦ ᔪᓚᐃ 10ᒧᑦ.

2010ᒥ ᐅᐸᓂᐊᕐᑕᕗᑦ: ᓄᓇᐃᑦ ᐊᑯᓪ ᕼᐊᐃᕗᒃ ᕿᑭᑕᖓᓂ, ᐃᓚᐅᓗᑎᒃ ᐃᒃᐱᑎᓴᓐ ᓯᔭᕆᒃᑐᖅ (79º 25’N; 90º 45’Wᓄᓇᖑᐊᑎᒍᑦ), ᓯᑐᖀᓐ ᓯᒃᔭᕆᒃᑐᖅ (79º 05’N; 90º 00’W ᓄᓇᖑᐊᑎᒍᑦ), ᕗᐃᑦ ᓴᓐᑎ ᑲᖏᓱᐊ (79º05’N ; 87º00’W ᓄᓇᖑᐊᑎᒍᑦ), ᐊᒪ ᐸᓐᑎ ᑲᖏᓱᐊ (81º55’N ; 79º30’W ᓄᓇᖑᐊᑎᒍᑦ) -ᐊᕐᒍᐃ ᐊᓂᒍᕐᑐᑦ ᐅᐸᖃᑕᓚᐅᒥᔭᕗᑦ

ᑭᓇᐅᔭᖃᕐᑎᓯᔨᐅᔪᑦ: ᐱᕈᑲᓂᕈᓇᑐᓄᑦ ᑭᓕᓯᓂᐊᑎᓄᑦ ᑭᓕᓯᓂᐊᕐᑎᒪᕆᓄᓗ ᑲᑎᒪᔨᐅᔪᑦ

ᑭᓱᒨᖕᒪᖔᑦ. ᑕᒪᓇ ᐱᓕᕆᐊᕆᖃᑕᕐᑕᑕ ᑲᔪᓯᓂᕆᔭᖓ ᖃᐅᔨᓴᖃᑕᕐᑕ ᐃᒪᐃᑦ ᐊᒪᓗ ᓇᓂᓂᕆᔭᖏᑦ ᓄᑕᐅᖏᑐᓗᑎᒃ ᓂᖕᓕᓇᕐᑐᕐᒥ ᑕᕆᐅᖑᓗᑎᒃ ᓄᓇᒥ ᑰᒃᑐᑦ ᐊᑕᐅᓯᐅᖏᑐᕐᒥ ᐊᑯᓪ ᕼᐊᐃᕗᒃ ᕿᑭᑕᖓᓂ. ᑐᕐᖃᓗᐊᑕᕗᑦ ᖃᐅᔨᓴᕐᓂᓇᔪᑎᓂ ᑐᑭᓯᕐᑯᓗᑕ ᓂᓚᓱᒃᑐᕐᒥ, ᑕᕆᐅᕈᔪᓗᓂ ᒪᓂᕐᒥᑐᖅ ᐃᒪ ᖃᓄ ᓱᓂᓱᖑᒪᖔᑦ ᓂᓚᓱᒃᑐᑉ ᖁᑎᑐᖅ ᐊᕙᓐᓂᒃ ᐊᒪᓗ ᖃᓄ ᓱᓂᓱᖑᒪᖔ ᖃᓂᒋᔭᖓᓂᑐᕐᒥᒃ ᓄᓇᒥᒃ. ᑐᕐᖃᓗᐊᑕᕗᑦ ᐅᑯᓂᖓ ᐃᓗᓕᖃᒥᔪᖅ (1) ᓇᓗᓇᐃᓗᒍ ᖃᓄᑎᒋ ᐊᖏᑎᒋᒪᖔᑦ ᑕᐃᒪᐃᑐᒃᓴᔭᖅ ᓄᓇ, (2) ᓇᓗᓇᐃᓗᒍ ᓇᑭᖔᓯᒪᒪᖔᑦ ᐊᒪᓗ ᓄᑕᐅᖏᓂᖓ ᒪᓂᕐᒥᑐᖅ ᐃᒪᐅᑉ, (3) ᑐᑭᓯᓗᒍ ᐊᒪᓗ ᑐᑭᓯᓇᓯᑎᓗᒍ ᓄᓇᐅᑉ ᖃᓄᐃᓕᖓᓂᖏᑦ ᑐᑭᓯᓇᓯᑎᓗᒋᑦ ᐊᒃᑐᐊᓂᖏᑦ ᓄᓇᒥᑐᑦ ᐃᒪᐅᑉ ᐊᒪᓗ ᖁᐊᖑᐃᓇᕐᑐᑦ, ᐊᒪᓗ (4) ᑐᑭᓯᓇᓯᑎᓗᒋᑦ ᐃᔨᓄ ᑕᑯᓴᐅᖏᑐᑦ ᖃᓄ ᐊᒃᑐᐊᖃᕐᒪᖔᑕ ᑰᓂ, ᑕᓯᕐᓂ ᐊᒪᓗ ᖁᐊᖑᐃᓇᕐᑐᓂ. ᐊᕐᒍᓂ ᐊᓂᒍᕐᑐᓂ ᐊᒥᓱᖏᑐᓂ ᖃᐅᔨᓴᕐᓂᓇᔪᑎᓂ ᓄᑕᓂ ᑐᓴᕈᑎᓂᒃ ᐃᓱᓕᑕᕐᓂᖓᓂᒃ ᖃᓄᐃᑐᓂᖓᑕ ᐃᒪᐅᑉ ᐊᒪᓗ ᐃᔨᖕᓄᑦ ᓂᓚᓯᓂᐅᕐ ᐱᔨᑎᓕᓂᒃ ᓴᓂᕐᒥᑐᓂᒃ ᐃᒪᐅᑉ ᐊᒪᓗ ᑐᑭᓯᐊᕐᑕᕐᑕ ᓄᓇᐃ ᐊᕐᕌᒍᓂ ᐱᔨᑎᓕᓂᒃ ᓴᓂᕐᒥᑐᓂᒃ ᐃᒪᕐᓂᒃ. ᑕᒪᓇ ᑭᓕᓯᓂᐊᕆᑎᓕᔨᓴ ᑕᒪᑐᐊᖅ ᑰᕐᖃᑐᓂᒃ ᖃᐅᔨᓴᓂᐅᔪᐊᖅ ᖃᐅᔨᓴᕐᑕᕐᑐᓂᒃ. ᑕᑯᐊ ᑰᑦ ᑭᓇᐅᔭᓴᐅᑕᕐᑎᓪᓗ ᐊᒪᓗ ᑕᒪᓇ ᑭᓕᓯᓂᐊᕐᑎᓂᔭᖅ ᑭᓕᓯᓂᐊᓂᒧᑐᐊᑎᐊ ᑐᕐᓚᐊᖅ.

ᖃᓄᐃᓕᖓᓂᕆᔭᑕ ᐅᓂᑳᖓ - 2009ᒥ ᐱᓕᕆᐊᕗᑦ. ᐊᑯᓂᖓᓂ ᒪᔨ 25ᓗ ᐊᐃᕆᓕ 20ᓗ ᓂᓚᓱᓂᒥ ᖃᐅᔨᓴᕐᑕᓚᐅᕐᒧᑦ ᐊᒪᓗ ᑰᓂᕆᔭᖏᓂᒃ ᑰᑦ ᐃᒃᐱᑎᓴᓐ ᓯᔭᕆᒃᑐᕐᒥ. ᖃᕐᑕᓱᖃᕈᓐᓂᕐᓂᑦ ᐃᓱᓕᑕᕐᓂᕆᔭᖕᓗ ᑕᐃᒪᓇᑎᒥᓗᐊ ᖃᐅᔨᓴᕈᓇᓚᐅᖏᑐᑦ ᓯᑐᖀᓐ ᓯᒃᔭᕆᒃᑐᕐᒥ ᐊᒪᓗ ᕗᐃᑦ ᓴᓐᑎ ᑲᖏᓱᐊᓂ. ᓄᐊᑎᓚᐅᕐᒧᑦ ᐃᒪᕐᒥ ᖃᐅᔨᓴᕐᑕᐅᔭᖕᓴᓂ ᖃᓂᒋ ᐃᒪᕐᓗᖃᕐᑎᒪᖕᒪᑦ ᐊᒪᓗ ᓯᕈᐃᕐᖃᓕᕐᒪᑕᓗ. ᖃᕐᑕᕐᑎᑕᐅᓯᒪᔪᑦ ᓇᓗᓇᐃᓯᔨᑦ 2008ᒥ ᐊᐱᓗᐊᓚᐅᖏᑐᖅ ᑭᓯᐊᓂ ᑕᐃᒪᐃᓚᔨᒪᑦ ᔪᓚᐃ ᐅᕐᑯᓂᕐᐸᓇᔭᖓ 12ᒥᒃ ᐅᕐᑯᓂᖅᓗᓂ ᐊᒪᓗ ᐅᑭᐅᑯᑦ ᓂᓚᓯᖏᑖᖓ 52ᒥᒃ ᓂᒃᓚᓯᖓᓂᖃᓗᓂ. ᐊᑯᓂᖓᓂ ᐊᐃᕆᓕ 7ᒥᑦ 14ᒧᑦ ᒪᕈᐃᓂ ᐅᓇᑕᕐᑐᓴᓄᑦ ᐅᐸᖃᑕᓚᐅᑐᒧᑦ. ᔨᓂᐅ ᓄᖑᐊᓂ ᖃᖏᑕᓯᑯ ᑰᓂ ᓇᓗᓇᐃᓯᓚᐅᑐᖓ ᐊᑯᓪ ᕼᐊᐃᐳᒃ ᕿᑭᑕᖓᓂᑐᓂᒃ ᓄᑕᓂᒃᓗ ᕿᓂᓗᖓ ᑰᓂᒃ.

2010ᒥ ᑭᓕᓯᓂᐊᓂᕆᓛᕈᒪᔭᕗᑦ: ᑕᒪᑐᒪᓂ ᐊᕐᒍᔪᕐᒥ ᑲᔪᓯᑲᓂᓂᐊᑐᒍᑦ (ᒪᔨᒥᑦ ᐊᐃᕆᓕᒧᑦ) ᐊᒪᓗ ᐊᐅᔭᖓᓂ (ᔪᓂᒥᑦ ᔪᓚᐃᒧᑦ) ᑕᐸᓂ ᐱᓕᕆᓗᑕ. ᓯᕗᓕᐹᑦ ᐱᓇᓱᐊᕈᓰᑦ ᐱᖓᓱᑦ ᐱᒋᐊᕐᓗᓂ ᓄᖑᐊᓂ ᒪᔨᐅᑉ ᐅᓄᖕᒋᑐᓗᑕ ᑭᓕᓯᓂᐊᕐᑎᑎᒍᑦ ᑐᖃᑕᕐᕕᖃᓗᑕ ᒪᑭᐅᓪ ᐱᓕᕆᕕᐊᑕ ᑐᖃᑕᕐᕕᖓ ᐃᒃᐱᑎᓴᓐ ᓯᔭᕆᑐᖓᓂ. ᕿᒥᕈᓂ ᑕᐃᓱᒪᓂᐅᓕᕐᐸᑦ ᐱᒪᕆᔪᐊᖑᔪᑦ ᐱᔪᑎᒋᓗᒍ ᑕᐃᒪᐃᓕᐅᑎᓗᑕ ᓱᓂᕐᓯᒪᖏᑐᑦ ᕿᒥᕈᖃᑕᕐᑎᒍᑦ ᐊᒪᓗ ᖃᓄᐃᓕᖓᓂᖏᑦ ᑰᑦ ᑕᐅᕕᒃᔪᐊᖑᓚᐅᑎᓗᒍ ᑲᔪᓯᓂᑯᐃᑦ. ᐊᒪᓗ ᑕᒪᓇ ᖁᐊᖑᐃᓇᕐᑐᖅ ᐱᕕᖃᑎᓯᖃᑕᕐᑐᖅ ᐅᕙᑎᓂᒃ ᖃᐅᔨᓴᕐᓯᒃᑕᓄᑦ ᐅᐸᒍᓇᑕᐃᓇᓇᓗᒋᑦ. ᑕᒪᓇ ᐱᓕᕆᐊᕗᑦ ᐃᓗᓕᖃᒥᔪᖅ ᖃᓄᐃᓕᖓᓕᒪᖔᑕ ᑕᕆᐅᖑᓗᑎᒃ ᖃᖓᒍᑦ ᑰᒃᑐᑦ ᓂᓚᓯᒃᑎᓗᒍ ᐊᒪᓗ ᐊᕿᓯᒪᓂᖏᑦ ᓴᕿᔮᕐᑐᑦ ᓂᓚᐃᑦ ᐊᒪᓗ ᖁᐊᓂᑯᐃᑦ ᖃᑎᒃᓯᓯᒪᔪᑦ ᓯᑯᐃᑦ. ᖃᐅᔨᓴᒐᓴᑎᓂᒃ ᐃᒪᕐᓂᒃ ᐱᑲᓂᓛᑐᒍᑦ ᐃᒪᕐᓗᖃᒪᖔᑕ ᐊᒪᓗ ᓯᕗᓂᐊᓂ ᐊᕐᒍᓂ ᐊᓂᒍᕐᑐᓂ ᖃᐅᔨᖃᑕᓚᐅᑕᑎᓂᑦ ᖃᓄᐃᓂᕐᓴᐅᓕᒪᖔᑕ ᑕᐃᒪᐃᑯᑕ ᑎᑎᕋᓯᒪᔪᖁᑎᖃᑎᐊᓂᓴᐅᔪᓇᕐᑐᒍᑦ ᐊᓯᔨᕐᐸᓕᐊᔪᓂᒃ ᐃᒪᕐᓂᒃ ᐊᒪᓗ ᐱᒪᕆᐅᓂᖓᓂᒃ ᐃᒪᕐᓗᐃᑦ ᑕᒪᐃᓄᑦ ᑕᑯᓴᐅᔪᓄᑦ ᐃᔨᓄᓗ ᑕᑯᓴᐅᖏᑐᓄᑦ. ᑕᒪᓇ ᑭᓕᓯᓂᐊᓂᖅ ᐃᑲᔪᖃᑕᕐᑐᖅ ᑐᑭᓯᐅᒪᓂᑎᓂᒃ ᑕᑯᓴᐅᔪᓂᒃ, ᐃᒪᕐᓗᓂᒃ ᐊᒪᓗ ᐅᒪᔪᐃᑦ ᖃᓄᐃᓕᕙᓕᐊᓂᖏᓂᒃ ᓱᓂᕐᑕᐅᔪᓄᑦ ᑰᓄᑦ. ᐊᓯᖏᑦ ᐱᓕᕆᓂᐅᔪᑦ ᓄᓇᐅᑉ ᐃᑭᐊᖏᓂᑐᓂ ᓄᓇᖑᐊᑎᒍᑦ ᓇᓗᓇᐃᕐᓯᓂᖅ ᖃᐅᒪᒃᑕᔪᖑᔭᕐᒥᒃ ᑕᐳᑎᔪᓇᕐᑐᖅ ᒪᓂᕋᕐᒥᒃ, ᐊᐳᑎᓂᒃ ᕿᖑᒥᒐᕐᓂᖅ ᐊᒪᓗ ᓄᐊᑎᓗᑕ ᑎᑎᕋᐸᓕᐊᔪᓂ ᐃᒥᓃᓇᖅ 6ᖑᔪᓂ ᓯᓚᓂᐊᕐᕕᖕᓂ. ᔪᓂᐅᑎᓗᒍ ᓱᓂ ᕿᓂᓚᐅᑐᒍᑦ ᑰᒃᑐᕐᓂᒃ ᐊᒪᓗ ᑰᑐᖃᓂᒃ ᐋᑯᓪᒥ ᐊᒪᓗ ᐃᐅᓪᓴᒥᐊ ᕿᑭᑕᖏᓂ. ᐱᓕᕆᓂ ᐃᓗᓕᖃᓚᐅᒥᔪᖅ (ᐃ) ᑰᐸᓕᐊᔪᑦ ᓂᓚᓱᖕᓂᖏᑦ, ᖃᓄᑎᒋ ᑰᒃᑎᒋᒪᖔᑕ ᐊᒪᓗ ᐃᒪᕐᓗᖃᒪᖔᑕ ᑕᑯᐊ ᑰᑦ, (ᐱ) ᖃᐅᔨᓴᕐᓗᑕ ᐃᔨᓄ ᑕᑯᓴᐅᖏᑐᓂ ᖁᐱᕈᖃᒪᖔᑕ, (ᑎ) ᓂᒃᓚᓱᖕᓂᖓᓂ ᐅᐊᓯᓗᑕ ᐊᒪᓗ (ᑭ) ᖃᐅᔨᓴᕐᓴᓂ ᐱᓪᓗᑕ ᖃᐅᔨᓴᕐᓗᒥᓗ ᓴᕙᕿᔭᒃᓴᖃᓂᕐᒥᑦ. ᖁᓕᒥᒍᓕᑯᑦ ᐅᐸᑲᑕᕐᓂᐊᒥᔪᑦ ᐊᓯᕐᒥᓂ ᑰᓂᒃ, ᐃᓚᐅᓗᑎᒃ ᕗᐃᓐᓴᓐᑎ ᑲᖏᓱᖓ, ᓯᑐᕋᓐ ᓯᔭᕆᒃᑐᖅ, ᕿᑭᖓᓂᑐᖅ ᓯᒃᔭᕆᒃᑐᖅ, ᐸᓐᑎ ᓯᔭᕆᒃᑐᖅ, ᓯᑲᐃᔭ ᓯᒃᔭᕆᒃᑐᖅ ᐊᒪᓗ ᐊᒪᕈᖅ ᓯᒃᔭᕆᒃᑐᖅ. ᖃᐅᔨᓴᒐᓴᓂ ᐱᓛᒥᔪᒍᑦ ᑰᓂᑦ, ᑕᓯᕐᓂᑦ, ᓯᑰ ᖃᖓᒍᑦ ᑰᑐᕐᓂᒃ, ᓄᓇᒥᑦ ᐊᒪᓗ ᒪᕐᑯᕕᐅᖃᑕᕐᓂᑯᓂᒃ ᐃᒪᕐᓗᖃᒪᖔᑕ ᐃᔨᓄᓗ ᑕᑯᓴᐅᖏᑐᓂᒃ ᖁᐱᕈᖃᒪᖔᑕ. ᑲᔪᓯᓂᐊᕐᑐᒍᑦ ᖃᖓᑕᕐᑎᑕᐅᓯᒪᔪᑯᑦ ᓄᓇᖑᐊᒧᖃᐃᓂᕐᒥᒃ ᓇᓂᓂᖏᓂᒃ ᑰᑦ, ᓇᐅᑯᓗ ᑰᒃᒪᖔᑕ ᖃᓄᐃᓕᖓᓂᖏᓗ. ᐃᒪᐃᑐᑎᓗᒍ ᐊᕐᒍᒥ ᓱᕐᓯᒪᔪᓂ ᐊᕿᓱᐃᖃᑕᕐᑐᒍ ᐊᓯᔨᕐᑐᕐᓗᒋᓪᓗ ᐃᓄᖃᖏᑐᓂ ᓯᓚᓂᐊᕐᕕᖕᓂᑐᑦ. ᑐᖃᑕᕐᕕᖄᕐᑐᑦ ᒥᑭᐅᓪ ᑐᖃᑕᕐᕕᖓᓂ ᐃᒃᐱᑎᓴᓐ ᓯᔭᕆᒃᑐᕐᒥ. ᐱᓕᕆᐊᕗᑦ ᐱᒍᑎᖃᒪᑦ ᑐᑭᓯᐅᒪᓂᖓᓂᒃ ᓯᓚᔪᐊᑉ ᑲᔨᕐᐸᓯᐊᑕ ᐊᕙᑎᖓᓂᒃ ᑕᐃᒪ ᑕᒪᑯᐊ ᐱᓕᕆᐊᕗᑦ ᒥᑭᑐᕐᒥᒃ ᐅᕙᓗᓃᑦ ᓱᓂᓂᖃᔮᖏᑐᖅ.

ᐱᒪᕆᐅᓂᖓ: ᑕᒪᓇ ᑭᓕᓯᓂᐊᓂᕆᔭᕗᑦ ᐊᒃᓱᕈᐊᕆᔭᕗᑦ ᑐᑭᓯᔪᓇᖁᓗᑕ ᐱᑐᐃᓇᐅᖏᑐᕐᒥ ᓱᓂᕐᓯᒪᖏᑐᕐᒥᒃ ᐊᒪᓗ ᖃᓄᐃᑐᖃᑕᒪᖔᑕ ᑕᕆᐅᖑᓗᑎᒃ ᑰᑦ ᐃᑎᓗᑎᒃ ᖁᐊᖑᐃᓇᕐᑐᓂ ᐊᒃᓱᓪ Hᐊᐃᐳᒃ ᕿᑭᑕᖓᓂ. ᑕᒪᓇ ᖃᐅᔨᓴᕐᑕᕗᑦ ᑐᑭᓯᕙᓕᑎᓯᖃᑕᕐᑐᖅ ᐱᔪᑎᖃᑐᓂᒃ ᖃᖏᓂᑐᑦ ᐃᑭᐊᕐᒥᖓᓂᑐᓗ ᑰᑦ ᑕᑯᓇᓂᑐᑦ ᐃᑎᓂᕐᒥ ᖁᐊᖑᐃᓇᕐᑐᓂ ᐊᒪᓗ ᓱᓂᓯᒪᖏᑐᑦ ᐃᔨᓄ ᑕᑯᓴᐅᖏᑐᓂᒃ ᐅᒪᔪᕐᓂ ᐊᓇᐅᒪᔪᑦ ᑕᑯᓴᐅᔪᒥ ᐊᒪᓗ ᐃᒪᕐᓗᓂ ᐅᖁᔪᑐᐃᓇᒥᖏᑐᑦ ᓯᓚᔪᐊᑉ ᑲᔨᕐᐸᓯᐊᓂᓱᓂᒃ. ᐊᒪᓗᑲᓂ, ᖃᐅᔨᓂᕆᔭᕗᑦ ᐱᓕᕆᐊᓂᑦ ᑰᑦ ᐱᓪᓗᒋᑦ ᐊᑐᕐᑕᐅᔪᓇᕐᑐᑦ ᑐᑭᓯᔭᐅᑲᓂᖁᓗᒍ ᖃᓄ ᐃᓄᓯ ᑲᔪᓯᒪᖔᑦ ᐊᓯᖏᓂ ᐊᓂᕐᓂᖃᖏᑐᓂᑐᑦ ᓲᕐᓗ ᓯᖑᓇᒥ.