SCIENTIFIC RESEARCH LICENCE APPLICATION
LAND, FRESHWATER & MARINE BASED RESEARCH

NRI strongly recommends that applicants review the following documents prior to submitting an application: *Scientific Research Licencing Guidelines* and *Negotiating Research Relationships in Inuit Communities: A Guide for Researchers.*
For more information about the Nunavut Research Institute (NRI) please visit our web site www.nri.nu.ca

IMPORTANT
This application fulfills the requirements for the NIRB environmental screening.
Please be advised that your application will not be processed until the application form, project summary, and maps are received.

SECTION 1: APPLICANT INFORMATION

1a. Project Title **Toxic Heavy Metal Bioaccumulation and Genotoxicity in Small Mammal Population Inhabiting Post-Mining Areas of Nunavut: Case study of Nanisivik Mine**

1b. Project Number

Please indicate if applicant has submitted any previous application(s) to NRI related to this project proposal? Yes ___ **No** ___
If yes, please indicate the previous NRI licence number: _____

Please indicate if applicant has submitted any previous application(s) to NIRB related to this project proposal? Yes ___ **No** ___
If yes, please indicate the previous NIRB project number(s): _____

2. Applicant's full name and mailing address:

Dr. Solomon Amuno & Dr. Som Niyogi
C/O Department of Biology
University of Saskatchewan
112 Science Place,
Saskatoon, SK S7N 5E2

Phone: 306-966-4453
Fax: 306-966-4461
Email: som.niyogi@usask.ca

3. Field Supervisor's name and mailing address:

Phone:
Fax:
Email:

4. Other Personnel list (name, position, affiliation)

Mazino Amuno
School of Computing and Information Systems
University of Tasmania, Australia

SECTION 2: AUTHORIZATION NEEDED

1. Identify <u>all</u> known regulatory authorizations required for the project (include all that may apply):

Y/N	
	Regional Inuit Association: Land Use Permit/Exemption Certificate
Y	Nunavut Planning Commission: Plan Conformity Determination (Kivalliq, North Baffin only)
	Aboriginal Affairs, Northern Development Canada (GOC): Land Use Permit / Fuel Cache Notification
	Department of Fisheries and Oceans (GOC): Fisheries Research License, Marine Mammal transport license
	Environment Canada/Canadian Wildlife Service: Migratory Bird Research permit Environment
	Canada/Canadian Wildlife Service: Access to National Wildlife Area
	Parks Canada: National Parks Research Permit
	Community and Government Services (GN): Municipal Land Lease
	Culture and Heritage (GN): Archeology/Paleontology Research Permit
Y	Department of Environment (GN): Wildlife Research Permit

2. List the <u>active</u> permits, licences, or other rights related to the project proposal and their expiry date:

_____

_____

3. Have you applied for all authorizations required to conduct the project proposal activities?

☑ **YES** ☐ **NO**

SECTION 3: PROJECT PROPOSAL DESCRIPTION

1. Indicate the activities related to the project proposal:

	Temporary camp (to be removed at end of field season)
	Permanent camp (to remain for life of authorization)
	Construction of recreational or safety cabin
	Temporary fuel storage (to be removed at end of field season)
	Permanent fuel storage (to remain for life of authorization)
	Placement of structures for life of permit (other than camp or cabin – i.e. scientific instruments)
	Placement of permanent structures (other than camp or cabin – i.e. scientific instruments)
	Air surveys (i.e. geophysical, wildlife)
	Use of aircraft/watercraft/land vehicle for personnel drop-off and pick-up to project location
	Use of on-site mechanized vehicles (i.e. atv, snowmobile, truck, zodiac)
	Sewage or grey water disposal via sump
	Hazardous waste storage or disposal
	Solid waste disposal
	Chemical storage
	Explosives storage
	Soil testing

	Soil disposal/ soil storage
	Incineration of combustible wastes and removal of non-combustible wastes
	River/ stream/ lake crossing or work/ bridge
	Drainage alteration
	Geoscientific sampling by diamond drilling
X	Geoscientific sampling by soil sampling
	Geoscientific sampling by trenching
	Geoscientific sampling by borehole core
	Blasting
	Channeling
	Excavation
	Hydrological testing
	Abandonment and restoration
	Site restoration (fertilization/ grubbing/ scarification/ spraying/ recontouring)
X	Research
X	Ecological survey
X	Harvesting
X	Removal of vegetation for scientific purposes
	Other:

2. Personnel

Total No. of personnel on site = (A)	3	Total No. of days on-site = (B)	90 (less than 6hrs per day	**Total No. of Person days (A) × (B) = 270**

3. Timing

Period of operation: **July 2015** *to* **July 2016**

Proposed term of authorization: _____ *to* _____

Please outline the phases of the proposed project (construction/ operation/ decommissioning) including the timing and scheduling of each phase.

4. Location(s) of data collection:

Location Name	**Region** North Baffin, South Baffin, Kivalliq, Kitikmeot	**Co-ordinates** Lat (degree / minute), Long (degree / minute)	**NTS Map Sheet #**	**Land Status** Crown, Commissioners', Inuit Owned
Nanisivik Mine Area, Arctic Bay	**North Baffin**	**73° 02' N, 84° 31' W**		**Crown land**

If the project proposal includes a **camp**, please provide the coordinates of the camp location
Lat (degree/minute) _____ Long (degree/minute) _____
NTS Map Sheet # (if different from above) _____

The Nunavut Impact Review Board may require additional location information in a subsequent Project Specific Information Requirement (PSIR) submission. This may take the form of a digital Geographic Information Systems (GIS) file.

SECTION 4: NON-TECHNICAL PROJECT PROPOSAL DESCRIPTION

Please attach a non-technical description of the project proposal, no more than 500 words, in English and Inuktitut (+Inuinnaqtun, if in the Kitikmeot). The project description should outline the following:

Project Title: Toxic Heavy Metal Bioaccumulation and Genotoxicity in Small Mammal Population Inhabiting Post-Mining Areas of Nunavut: Case study of Nanisivik Mine

- Researcher's Name and Affiliation:
  - Dr. Solomon Amuno, Nunavut Impact Review Board, Cambridge Bay, NU (Principal Investigator)
  - Dr. Som Niyogi, Department of Biology, University of Saskatchewan SK (Co-investigator)
- Project Location: Nanisivik Mine, Arctic Bay
- Timeframe: July 2015 to July 2016

- Project Description

The purpose of this research is to monitor toxic heavy metal bioaccumulation and genotoxicity (DNA damage, chromosomal aberrations and mutation inductions) in selected small mammal population (Arctic hare) inhabiting the Nanisivik mine area. Additionally, our study is also interested in investigating from a post-closure perspective the concentration of heavy metals, including lead isotopic signatures of soils and vegetation near the vicinity of the Nanisivik mine, as well as to determine the different sources of contamination and to ascertain if significant differences exist since cessation of mining operations.

- Purpose, Goals and Objectives.

The purpose of our study is to develop an increased understanding of the spatial distribution of trace metals in the local environment (soil and vegetation), as well as physiological changes and genetic responses of selected small mammal population (arctic hare) exposed to historical mine wastes residues in the post-mining area of the former Nanisivik mine. The short term objectives of this research project are as follows:

1. To monitor the bioavailability of trace metals (arsenic, cadmium, chromium, copper, nickel, lead and zinc) in the vicinity of the former mining area (soils, berries and lichens) and in target organs/tissues (kidneys, liver, brain, muscles and bones) of selected small mammal models inhabiting the area. The focus is to compare contaminant load in surface soils (15-20 samples), vegetation (25-30 samples) and target tissues of Arctic Hare (12 animals) sampled from the vicinity of the former mining area, with those farther away (~40-80 km) from the site to determine if significant differences exist between the two groups.

2. To compare extent of DNA damages, and enzyme activities such as Delta-aminolevulinic acid dehydratase (ALAD), lipid peroxidation, glutathione, and catalase in arctic hare inhabiting the vicinity of the historical mining area, with those from control areas.

- Method of transportation and Research Methodology:

Research team members will be mobilized to site for ecological surveys using 4x4 trucks or ATVs.

Soil and Vegetation Sampling:

Surface soils (20 samples-1 sample per area) from depth of up to 20cm will be collected from several locations within the area, and with increasing distance from the mine area. Top soil samples will be collected using a hand trowel. 25-30 plant samples (lichens, berries and moss-1 to 3 samples per area) will be collected by hand from different locations within the study area, and with increasing distance from the mine area. Samples will be collected in areas around the mine area, as well as from background sites. No significant disturbance to the ecosystem is expected to result from this sampling program. No waste is expected to be generated from this activity.

Biological Sampling:

We are presently collaborating with the Ikajutit Hunters and Trappers Association in Arctic Bay to capture a total of 12 Arctic hares for our study. Animals will be trapped within and around the vicinity of the Nanisivik area, and euthanized (no use of lead shots). The weight, length and gender of each animal will be recorded immediately. Blood samples will be collected from each animal and stored in prepared vials. Each animal will be dissected for the removal of target organs, such as kidney, liver, testicles and femoral bone. Tissue samples are to be stored in appropriate polyethylene vials for metal analyses at University of Saskatchewan, and also in histology jars containing formalin for preservation of samples for histopathological studies at Guelph University. All biological samples will be stored in cooler and transported to respective laboratories. No significant disturbance to the ecosystem is expected to result from this sampling problem. Waste biological tissues resulting from dissection will be carefully collected, bagged and disposed offsite in Arctic Bay.

Community Consultation and Reporting

We have been in consultation with the Ikajutit Hunters and Trappers Association in Arctic Bay, since December 2014. Our research project was developed in consultation with the HTO, and has received approval from the local HTO (Please see attached letter of support). We will continue to engage with the HTO even after the sampling season to share results of the research, and implication for Arctic Bay residents. Our key expected results is to gain a preliminary understanding of the toxic effects of historical mining wastes on metal bioaccumulation, histopathological alterations in reproductive key organs (and DNA damage) in selected small mammal population inhabiting the vicinity of a former lead-zinc mine in Nanisivik. Additionally, given that former lead-zinc mine is still undergoing remediation/reclamation, our intention is to use this specie (Arctic Hare) as a sentinel for contaminant monitoring and ecological risk assessment, as well as to generate baseline information of exposure to support post-closure monitoring assessment.

SECTION 5: MATERIAL USE

1. List equipment (including drills, pumps, aircrafts, vehicles etc.):

Equipment type and number	Size – dimensions	Proposed use
Hand trowel		Surface soil sampling
ATV or 4X4 truck		Transportation from Arctic Bay to Nanisivik

2. Detail fuel and hazardous material use:

Fuel	Number of Containers and Capacity of Containers	Total Amount of Fuel (in Litres)	Proposed Storage Methods
Diesel			
Gasoline			
Aviation fuel			
Propane			
Other			
Hazardous Materials and Chemicals		**Total Amount of Hazardous Materials and Chemicals (in Litres)**	

Will you cache fuel on Crown or Inuit Owned Lands to support field research activity
YES (NO)

If YES, please complete the table below; provide details for each planned fuel cache

Cache Size (amount of fuel in litres)	Fuel Type	Cache Location (UTM or Lat/Long)	Container Type/Size	Proposed Removal Date

Researchers must notify the Lands Division of AANDC of any fuel caches on Federal Crown Lands in Nunavut, notification is required within 30 days of establishing the cache. Researchers must also apply in advance to the appropriate Regional Inuit Association for permission to cache fuel on Inuit Owned Lands in Nunavut.

3. Detail daily water consumption rates

Daily amount (in Litres)	Proposed water retrieval methods	Proposed water retrieval (source) location
0 litres		

Please note: You may use up to 50 cubic meters of water per day in Nunavut without obtaining a licence from the Nunavut Water Board, however, you must apply to The Nunavut Water Board for authorization to use water without a license.

Any water use in excess of 50 cubic meters of water may require a Class A license from the Water Board.

SECTION 6: WASTE DISPOSAL AND TREATMENT METHODS

1. List the types of waste:

Type of waste	Projected amount generated	Method of Disposal	Additional treatment procedures
Sewage (human waste)			
Greywater			
Combustible wastes			
Non-Combustible wastes			
Overburden (organic soil, waste material, tailings)			
Hazardous waste			
Other:			

2. Will you be incinerating combustible waste, removing all solid waste, and removing the ash generated from incineration?

☐ **YES** ☐ **(NO)**

3. Will you deposit sewage to a sump?

YES (NO)

***If yes, have you applied to the Nunavut Water Board for approval to deposit waste without a license (required for any deposit of sewage to a sump in Nunavut)**

YES (NO)

SECTION 7: COMMUNITY INVOLVEMENT & REGIONAL BENEFITS

1. List the community representatives that have been contacted and provide the minutes of the meetings if available:

Community	Name	Organization	Date Contacted
Arctic Bay	Jobbie Attitaq	HTO	December 2014, January 2015 and June 2015

2. Please identify any employment, contracting or training opportunities for Nunavut residents that may result from the project.

Our entire sampling program is contracted to the Arctic Bay HTO. We are also providing teleconference training to HTO on protocols for biological sampling and ecological risk assessment.

3. Please identify any potential risks to the health, safety or livelihoods of Nunavut residents that may result from the project?

None

Describe and attach documentation regarding community support or concerns for the proposed project:

Please see attached letter of support from HTO

5. Is there a traditional knowledge component to this research project? If yes, please explain:

No

SECTION 8: GENERAL QUESTIONS

1. Do you give NRI permission to publish project information in the Nunavut Research Institute Annual Compendium of Research Undertaken in Nunavut?

✓**YES** ☐ **NO**

2. If your research is related to climate change, do you agree to share your annual summary report with the Nunavut Climate Change Centre at climatechange@gov.nu.ca?

YES ☐ **No** ☐

(Highlight or Check one)

3. In addition to the application form, applicants are required to submit additional information in an electronic format to the Manager, Research Liaison, at mosha.cote@arcticcollege.ca. Please check that the following have been submitted to NRI:

☒ **Project Summary** -in English and Inuktitut (+Inuinnaqtun, if in the Kitikmeot)
☒ **NTS Maps** of the project

Applicants:

Dr. Solomon Amuno/ Dr. Som Niyogi	Advisor/Associate Professor	24 June, 2015
Signature	**Title**	**Date**