

Naturally Occurring Radioactive Material (NORM)

October 2016

What is NORM?

Naturally occurring radioactive material (NORM) is material found in the environment that contains radioactive elements of natural origin. NORM primarily contains uranium and thorium (elements that also release radium and radon gas once they begin to decay) and potassium. These elements are naturally decaying and are considered a primary contributor to an individual's yearly background radiation dose.

Where can NORM be found?

NORM is often found in its natural state in rocks or sand. It can also be associated with oil and gas production residue (such as mineral scale in pipes, sludge and contaminated equipment), coal ash (produced from burning coal for energy production) and on filter media (such as the used filters from municipal drinking water treatment equipment). NORM can also be present in consumer products, including common building products (like brick and cement blocks), granite counter tops, glazed tiles, phosphate fertilizers and tobacco products.



Pipeline contaminated with NORM
(Photo courtesy of Tervita Corporation)

Did you know?

- NORM is material naturally found in the environment that contains radioactive elements.
- The handling and disposal of NORM within Canada is regulated by the provincial and territorial governments.
- The transport, import and export of NORM must follow Canadian Nuclear Safety Commission (CNSC) regulations.
- NORM-contaminated equipment and waste should only be handled by a person with appropriate radiation training.

Some industries may regularly come into contact with NORM – for instance, those engaged in the production of oil and gas, phosphate fertilizers, forest products and thermal electricity; mineral extraction and processing; tunneling and underground workings; metal recycling; waste management; and water treatment.

How is NORM regulated?

In Canada, NORM is regulated by the provincial and territorial governments, each having its own specific regulations on the handling and disposal of the material. The [Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials](#) have been developed by the Federal Provincial Territorial Radiation Protection Committee (FPTRPC) to harmonize standards throughout the country and ensure appropriate control over NORM; however, provincial regulations should also be consulted.

NORM is exempt from the application of the [Nuclear Safety and Control Act \(NSCA\)](#) and its regulations except under the following circumstances:

- When NORM is associated with the development, production or use of nuclear energy as set out in the CNSC's [General Nuclear Safety and Control Regulations](#).
- When NORM is imported into Canada or exported from Canada as set out in the CNSC's [Non-proliferation Import and Export Control Regulations](#).
- The transport of NORM when the specific activity is greater than 70 Bq/g (70 kBq/kg) as set out in the CNSC's [Packaging and Transport of Nuclear Substance Regulations](#) and Transport Canada's [Transport of Dangerous Goods Regulations](#). Contact the CNSC at 1-800-668-5284 or by email at info@cnscccsn.gc.ca if you require information on the transport of NORM above the limit specified.

How is NORM detected?



Survey meter detecting NORM in the sludge of a contaminated vac truck
(Photo courtesy of Tervita Corporation)

Natural background radiation comes from the ground, building materials, air, food and cosmic rays. Depending on where you live, levels of this type of radiation can vary. Radiation readings above typical background radiation levels may indicate the presence of NORM. Determining the type of material present is essential to assess what, if any, precautions need to be taken with the material. This process is called characterization. Radiation surveys used for characterization should be conducted by personnel trained in radiation safety or by external consultants to determine if the suspect material is NORM or man-made radioactive material.

How should NORM be handled?

Although concentrations of NORM are usually quite low and the risk is minimal, safe handling of the material is important, since higher concentrations of NORM can result when the material is processed. This is often referred to as technologically enhanced NORM, or TENORM.

Because specific safety measures may be required to protect workers who handle NORM-contaminated equipment or NORM waste, NORM should only be handled by a person with appropriate radiation safety training and training in the precautions for hazardous industrial substances.

Best practices for individuals and facilities encountering NORM include:

- providing training and procedures to staff where there is the possibility of encountering NORM
- not eating, drinking or smoking in areas where the presence of NORM is a possibility
- storing NORM and any contaminated materials (including clothing) and waste in a designated area with access limited to authorized personnel
- minimizing operations that may generate dust containing NORM (e.g., cutting, grinding or polishing)
- minimizing the time spent in NORM-contaminated work areas and storage areas
- maximizing the distance from the source when handling or storing NORM
- using appropriate shielding to minimize dose rates from the material if warranted
- disposing of NORM-contaminated materials efficiently, to avoid stockpiling the material

Other (or more involved) measures should only be considered under the direction of personnel trained in radiation safety, specialized in the handling and disposal of NORM. Precautions can include:

- decontaminating equipment that has been exposed to NORM prior to disposal
- using personal protective equipment, including non-porous coveralls, boots and gloves, and protective eyewear and respirators, depending on the situation
- ensuring that pipes are sealed and ground covers are used, to prevent environmental contamination
- preventing dust inhalation, by keeping NORM materials damp with water
- ensuring that all workers are checked for any contamination with NORM before leaving the work area
- evaluating and decontaminating areas of potential NORM contamination by using high pressure washing or high-efficiency particulate air (HEPA) filter vacuuming



Pipeline cleaning
(Photo courtesy of Tervita Corporation)

How do I dispose of NORM?

NORM-contaminated waste should not go to a regular landfill if it exceeds release limits published in the [*Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials*](#). It should be disposed of at a facility authorized to accept contaminated materials.

In Canada, there are four provincially licensed facilities available specifically for NORM disposal:

- [Pembina Class I Hazardous Waste Landfill](#), Alberta
- [Unity salt cavern](#), Saskatchewan
- [Melville salt cavern](#), Saskatchewan
- [Silverberry Landfill](#), British Columbia

Additional provincial regulatory limits may also exist for the disposal of NORM waste. An assessment by personnel qualified to determine disposal options should be considered.

Who to contact for additional information?

For additional information on NORM and to inquire about its safe handling and disposal, please consult the list of provincial contacts below. Additionally, a list of NORM consultants can be found by doing an Internet search, or by visiting the Business Directory of the [Canadian Radiation Protection Association Web site](#).

Additional resources

- Technical Report on the Management of Naturally Occurring Radioactive Material (NORM) in Waste (prepared by the NORM Waste Management Technical Committee, available by contacting the [Energy Resources Conservation Board of Alberta](#))
- [Canadian Association of Petroleum Producers: Guide for Naturally Occurring Radioactive Material](#)
- [Canadian Nuclear Society: Naturally Occurring Radioactive Material Fact Sheet](#)
- [Canadian Nuclear Safety Commission: Alarm Response Guidelines for Radiation Portal Monitoring Systems](#)
- [International Association of Oil and Gas Producers: Guidelines for the management of Naturally Occurring Radioactive Material \(NORM\) in the oil & gas industry](#)
- [United States Environmental Protection Agency: Technologically-Enhanced, Naturally-Occurring Radioactive Materials](#)
- [The TENORM Page](#)
- [World Nuclear Association: Naturally-Occurring Radioactive Materials \(NORM\)](#)
- [United States Geological Survey: NORM Factsheet](#)

Provincial contacts

Alberta	Gary Hughes, Occupational Health and Safety 780-415-0612 gary.hughes@gov.ab.ca		
British Columbia	Caroline Nakatsuka, Ministry of Energy, Mines and Natural Gas 250-952-0500 caroline.nakatsuka@gov.bc.ca		
Manitoba	Lorne Barsness, Manitoba Mineral Resources 204-637-2472 Lorne.barsness@gov.mb.ca		
Newfoundland and Labrador	Nancy Hounsell, Service NL 709-729-4455/709-729-4450 nhounsell@gov.nl.ca	Joan Hann, Department of Environment and Conservation 709-729-1771 joanhann@gov.nl.ca	Craig Bugden, Department of Environment and Conservation 709-729-6483 cbugden@gov.nl.ca

Northwest Territories and Nunavut	Gerald Enns, Government of the Northwest Territories 867-920-8044 gerald_enns@gov.nt.ca	Judy Kainz, Workers' Safety & Compensation Commission 867-669-4418	
Nova Scotia	Colleen Rodgeron, Nova Scotia Department of Labour and Advanced Education 902-424-7115 rodgerco@gov.ns.ca		
Ontario	Operational Issues, Ministry of Environment 416-326-6700 Picemail.moe@ontario.ca	Ministry of Labour 1-877-202-0008 webohs@ontario.ca	Lothar Doehler, Ministry of Labour (occupational exposure) 416-235-5765 lothar.doehler@ontario.ca
Prince Edward Island	Todd Fraser, Department of Environment, Labour and Justice 902-368-5037 ktfraser@gov.pe.ca		
Québec	Hugues Ouellette, Ministère du Développement durable, de l'Environnement de la Faune et des Parcs 418-521-3950, ext. 4925 hugues.ouellette@mddefp.gouv.qc.ca	<u>Radon-specific questions :</u> Jean-Claude Dessau, Comité intersectoriel québécois sur le radon, Ministère de la santé et des services sociaux dirdiff@gouv.qc.ca	
Saskatchewan	Sarah Keith, Ministry of the Environment 306-953-3477 Sarah.keith@gov.sk.ca	Tim Moulding, Saskatchewan Ministry of the Environment tim.moulding@gov.sk.ca	
Yukon Territory	Robert Rees, Workers' Compensation Health and Safety Board 867-332-1064 robert.rees@gov.yk.ca		

For more information:

1-800-668-5284 (in Canada)
613-995-5894 (outside Canada)
cnscc.information.ccsn@canada.ca

nuclearsafety.gc.ca