

ENVIRONMENTAL ASSESSMENT REGISTRATION

TEMPORARY STORAGE OF NORM

SUBMITTED TO: MINISTER OF ENVIRONMENT AND CONSERVATION DIRECTOR OF ENVIRONMENTAL ASSESSMENT PO Box 8700 St. John's, NL A1B 4J6

PREPARED BY: CROSBIE INDUSTRIAL SERVICES LIMITED AN ENVIROSYSTEMS COMPANY

June 2015



Registered to ISO 9001:2008

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1.0 NAME OF UNDERTAKING

TEMPORARY STORAGE OF NORM

2.0 **PROPONENT**

(i) Name of Corporate Body:

Crosbie Industrial Services Limited, an Envirosystems company

(ii) Address:

P.O. Box 8338 422 Logy Bay Road St. John's, Newfoundland, Canada A1B 3N7

(iii) Chief Executive Officer:

Mike Ryan President, CEO and Vice Chairman, Envirosystems Inc. 11 Brown Avenue, Dartmouth, Nova Scotia, Canada, B3B 1Z7 902.481.8008

(iv) Principal Contact Person for purposes of Environmental Assessment:

Roy Baker, B.Sc. (Chemistry) Director, Waste Operations, Crosbie Industrial Services Limited P.O. Box 8338, 422 Logy Bay Road, St. John's, NL, A1B 3N7 709.722.8212

3.0 THE UNDERTAKING

3.1 Nature of the Undertaking:

Crosbie Industrial Services (CIS), an Envirosystems Inc. company, is requesting approval for an amendment to its existing Certificate of Approval to operate a Waste Management System to include the temporary storage of *low level* Naturally Occurring Radioactive Materials (NORM).

Health Canada's *Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials* (the Guidelines) sets an upper value on the annual dose that members of the public or incidentally exposed workers should receive from a planned operation or single source to ensure that the public and incidentally exposed workers do not exceed the annual dose limit of 1 mSv.

The Guidelines set out principles and procedures for the detection, classification, handling and material management of NORM in Canada and provide the framework for the development of NORM management practices and guidelines. CIS has used these Guidelines in developing their NORM Management program and corporate policies.

This undertaking is for NORM activity less than 70 Bq/g and for incidentally exposed workers and members of the Public of 1.0 mSv/annum. In accordance with the Guidelines, where the estimated incremental annual effective dose to the public is less than 0.3 mSv/a and to the worker is less than 1.0 mSv/a, the NORM program classification is *Unrestricted* and no further action is needed to control doses or materials.

Only NORM in the **Unrestricted** program classification, as defined by the *Guidelines*, will be temporarily stored at the CIS facility as part of this undertaking. The Guidelines consider the radioactive hazard associated with this classification as insignificant, and no further control on the material is necessary on radiological protection grounds.

Although only NORM in the Unrestricted classification will be transported and temporarily stored as part of the proposed undertaking, additional action as outlined in our NORM Management Plan will be undertaken to minimize exposure to workers and the public.

Transport of NORM, with radioactivity levels below 70 Bq/g is not subject to federal transportation regulations. NORM shipments with activity greater than 70 Bq/g total specific activity are governed by the Federal

Transportation Regulations. Crosbie Industrial *will not* store NORM materials with activity greater than 70 Bq/g total specific activity which would classify the material as Class 7 radioactive material in accordance with the Transportation of Dangerous Goods Act and Regulations.

NORM is found throughout the natural environment including the tissues of living beings and in building materials like brick and cement blocks, granite counter tops & glazed tiles. NORM can also be associated with metal recycling, mineral & extracting processing, oil & gas production, forest products & thermal–electric production, water treatment facilities and tunneling underground workings.

People are constantly exposed to small amounts of ionizing radiation from the environment as they carry out their normal daily activities; this is known as natural *background radiation*. Radiation has always been present and is all around us. Life has evolved in a world containing significant levels of ionizing radiation. Our bodies are adapted to it.

Every day, people are exposed to radiation from various sources, both natural and human made. About 60 percent of radiation comes from nature. The sun, naturally occurring radioactive elements, and radon, a radioactive gas present in the air we breathe, are the main sources.

The chart below shows the amount each component of the background radiation dose received by the average Canadian. Dose is a general term that refers to the amount of energy absorbed by tissue from ionizing radiation. Dose is measured in sieverts (Sv) and is more commonly expressed in units of either millisieverts (mSv) - which represents a thousandth of a Sievert - or microsieverts (μ Sv) - one millionth of a sievert.



Source: Natural Background Radiation, CNSC, 2013

The average Canadian receives a typical annual dose of approximately 2.0 mSv/annum from background radiation. The table below displays the average effective dose in Canadian cities compared to worldwide average.

Cosmic radiation Terrestrial **Canadian City** Total (mSv/y) Radionuclides in Annual inhalation dose background the body (mSv/y) (mSv/y)(mSv/y) (mSv/y) Worldwide 2.4 0.4 0.5 1.3 0.3 CANADA 0.9 0.3 1.8 0.3 0.2 Whitehorse 1.9 0.5 0.2 0.9 0.3 Yellowknife 3.1 0.4 1.4 0.9 0.3 Victoria 1.8 0.5 0.1 0.9 0.3 0.1 0.4 0.3 Vancouver 1.3 0.5 2.4 0.3 0.3 Edmonton 0.5 1.3 Regina 3.5 0.4 0.3 2.4 0.3 4.1 0.2 0.3 Winnipeg 0.4 3.2 Toronto 1.6 0.4 0.2 0.8 0.3 Ottawa 1.8 0.4 0.2 0.9 0.3 Iqaluit 1.9 0.5 0.2 0.9 0.3 Québec City 1.6 0.4 0.2 0.7 0.3 Montreal 1.6 0.4 0.3 0.7 0.3 0.9 Fredericton 1.8 0.3 0.3 0.3 Halifax 2.5 0.3 0.3 1.5 03 0.2 Charlottetown 1.8 0.3 0.9 0.3 St-John's 1.6 0.2 0.7 0.3 0.4

Sources and Average Effective Dose from Natural Background Radiation in Selected Canadian Cities

Source: Natural Background Radiation, CNSC, 2013

Foods and drinks are other sources of radiation. For instance, bananas contain potassium-40, a radioactive substance present in nature. Potassium-40 is present in many other common foods including red meats, white potatoes, carrots, bananas, lima beans and Brazil nuts. Canadians are also exposed to man-made radiation throughout their lives, mainly from medical procedures like X-rays.

Below is a table showing the radiation dose comparisons from sources of exposure from familiar sources:

| Source of Exposure | mSv/Annum | |
|-----------------------------------|-----------|--|
| Dental x-ray | 0.005 | |
| Brazil nuts (100g) | 0.01 | |
| Chest x-ray | 0.014 | |
| Transatlantic flight | 0.08 | |
| CT scan of head | 1.4 | |
| CT scan of chest | 6.6 | |
| CT scan of whole spine | 10 | |
| USA average annual radiation dose | 6.2 | |

Source: Ionizing radiation: dose comparisons, Government UK, 2011

The maximum dose limit for a member of the public for this undertaking is 0.3 mSv / annum, however there is not expected to be any measurable

| Potassium-40 content in food | | | | |
|--|------------------------------|--|--|--|
| Food | Becquerel (Bq) per 500 grams | | | |
| Red Meat | 56 | | | |
| Carrot | 63 | | | |
| White Potato | 63 | | | |
| Banana | 65 | | | |
| Lima Bean | 86 | | | |
| Brazil Nut | 103 | | | |
| Brazil nuts also naturally contain radium-226 (between 19 and 130 Bq | | | | |
| per 500 grams.) | | | | |

dose from this activity outside the storage area or CIS's property boundary).

Source: Handbook of Radiation Measurement and Protection, Brodsky, A. CRC Press 1978

Research shows that radiation doses of up to 100 mSv/year have no measureable health effects in humans.

The Company prepared and submitted a comprehensive NORM Management Plan to the Department of Environment and Conservation in April 2015 for the safe handling and temporary storage of NORM generated by the offshore oil industry in Newfoundland.

Activities associated with the transport, handling and temporary storage of NORM will be conducted in compliance with the *Occupational Health and Safety Act and its Regulations*. This includes the responsibility for ensuring that contractors hired to perform work also comply with this legislation.

3.2 Purpose/Rationale/Need for Undertaking

NORM originating from Newfoundland offshore oil and gas operations is usually brought to the surface in produced water. As the water approaches the surface, temperature changes cause naturally occurring radioactive elements to precipitate as scale onto equipment such as field tubulars, vessels and pumps. These NORM materials are *not* generated from hydraulic fracturing (fracking) activities.

Newfoundland Offshore oil production platforms in operate in a harsh environment with unique operational & logistical challenges. Once NORM contaminated equipment is encountered there is a need oil producers to promptly move the equipment from the platform to a land based facility for temporary storage to allow sufficient time to make further arrangements to have the material sent to out of Province disposal or decontamination facilities. With limited options in Newfoundland to handle such materials, CIS has identified a need to expand our waste management services to accommodate oil and gas operators within the Province.

Waste management service contracts for oil & gas operator(s) in the Province request that their service providers be able to also provide temporary storage of NORM. Although the NORM temporary storage component of these service contracts only represents a very small portion of the overall scope of work, in order to compete for these service contracts then it is important for our company to be able to offer this service so that we are not at a competitive disadvantage.

3.3 Proponents Experience

Envirosystems Inc., a proud Atlantic Canadian organization with headquarters in Dartmouth, NS, is the most comprehensive provider of industrial cleaning and waste management services in Atlantic Canada. We have operating divisions located across the country and more specifically multiple locations in Newfoundland and Labrador, New Brunswick & Nova Scotia.

We are committed to the region and continue to invest in the communities that we work and live in. We have been helping businesses and governments achieve their industrial and environmental management goals for nearly 20 years.

Envirosystems is an experienced provider of NORM management services. We have performed decontamination of NORM contaminated equipment and have removed, contained and packaged many thousands of liters of NORM contaminated sludges, wastewaters and liquids. CIS has participated in handling NORM materials generated from Newfoundland Offshore Oil & Gas Operations for over a decade.

Crosbie Industrial Services also has in-house expertise for the management of NORM. Trained staff are experienced in the types of radiation, detection and exposure limits, documentation, classification, transportation, disposal, hazard recognition, evaluation and control, personnel protection and safe work practices for the handling this type of material. CIS currently has nearly 40 people with NORM safety training. Training subjects covered include:

- 1. NORM Awareness;
- 2. Worker Protection;
- 3. NORM Detection;
- 4. Safe Work Practices; and
- 5. Waste Management

CIS also has a chemist on staff with experience and supervisory training in the origin, detection and management of NORM. Our parent company, Envirosystems Inc, has a full time Radiation Safety Officer (RSO-1) on staff.

4.0 DESCRIPTION OF THE UNDERTAKING

4.1 Geographic Location:

The proposed storage will be within the existing property boundary of Crosbie Industrial's Waste Management Site located on 422 Logy Bay Road in the Municipality of St. John's. The site has been in operation for more than 30 years and consists of a roughly rectangular parcel of land that covers an approximate area of 0.58 ha and is located approximately 75 Metres off the main road and is secured to prevent unauthorized access. Please refer to Appendix B for the geographic location of the existing facilities and Appendix C for the existing site plan. The proposed temporary NORM storage area will be located approximately 200 metres from the main road and 250 metres from nearest residential property. NORM storage areas will not be situated on any protected natural areas. The existing access route to the site will be used to bring NORM materials to and from the site.





4.2 Physical Features:

The site is occupied by two buildings and a bulk storage tank farm. The majority of the site that is not occupied by the buildings and tank farm consists of asphalt pavement (Appendix C). There is a berm located along the east property boundary separating the site from a wetland to the east. Commercial-industrial properties are located to the north, south and west of the site. The subject property and adjacent properties are serviced by municipal water and sewer systems, and there are reportedly no active drinking water wells in the surrounding area.

CIS will use space within its existing yard to accommodate NORM contaminated material. Dedicated storage and containment systems will be employed and positioned to the North side the property (Appendix D) and will consist of a portable equipment pad having a dimension 14.6 metres long by 6.1 metres wide (89 square metres) and an enclosed storage containment system for small containerized materials having dimensions 16.2 metres long by 2.4 metres wide (39 square metres). The containment systems will be of steel construction and secured to prevent authorized access.

The site is currently equipped with groundwater-monitoring wells to ensure the environmental integrity of the site.

Located in an industrial area, the site and immediate surrounding area is currently zoned as Commercial Industrial (CI).

4.3 Construction:

The proposed NORM storage area will consist of an approximately 89 square metres portable equipment pad and a 39 square metres portable storage container. Both containment systems will be positioned on the north side of property. The containment systems will be constructed of steel and include the following components:

Laydown Pad

- Self-contained steel containment pad
- Built in collection sump, no floor drains
- Steel floor and side walls

Figure 1: Laydown Pad



NORM contaminated equipment will be wrapped / covered with a strong, flexible, water-resistant or waterproof material to shelter equipment from the elements.

The laydown pad is designed for outdoor use and has several easy clean or self-cleaning features. In the unlikely event that NORM contaminated solids or liquids is found in the self-contained laydown pad, the pad is designed to capture and retain these contaminants. Side gutters provide for simple and easy cleanup and removal of water and solids. The collected liquid is pumped out of the gutter for packaging. Solids that remain in the gutter can be removed manually or by use of a vacuum truck.

Storage Container

- Self-contained steel containment system
- 0.30 metre berm and no drains
- Corrugated steel floor

Figure 2: Storage Container



Equipment set-up is expected to take approximately 1-2 days to complete.

Both storage containment systems will have a complete compliment of emergency response equipment. In addition to the above the following items will also be implemented:

- Safe work guidelines
- Inventory management system
- Regular safety inspections
- Regular radiation monitoring
- Personnel protective equipment
- Norm safety training of personnel

The surfaces of the site consist of asphalt pavement and gravel cover. Based on an available topographic map and the observed site topography, regional surface drainage appears to be towards the east-southeast.

Based on available surficial geology maps, the native surficial soils at the site likely consist of glacial deposits, principally comprised of sand and gravel till overlying sedimentary bedrock. The characteristic permeability of sand and gravel till is moderate.

As the storage of NORM contaminated materials will be in a contained system, the risk of ground contamination from any spillages will be minimal.

4.4 **Operation:**

Crosbie Industrial Services, an Envirosystems company, has been operating a waste management system in the Province since 1982. Its experienced staff of environmental technicians, chemists and managers offer comprehensive services in Newfoundland and Labrador for the proper management of industrial waste streams.

CIS will continue to provide safe and environmentally sound industrial services and waste management solutions to our clients in a manner that complies with all conditions of our Certificate of Approval and applicable regulations & guidelines.

CIS anticipates encountering NORM contaminated tubulars (pipe) and associated equipment from a well work over approximately once every two to three years on average and NORM solids or liquid waste once every one to two years on average. A well work over may generate approximately four hundred tubulars for temporary storage. Similarly, the frequency of out of Province transport of NORM tubulars and associated equipment from a well work over is expected to happen approximately once every two to three years and solid and liquids waste approximately from platform maintenance activities approximately once every one to two years.

All NORM consignments will initially be analyzed for radioactive content prior to receipt at our site for temporary storage. Confirmatory assessments will also be conducted prior to acceptance at Crosbie Industrial's site. CIS will identify materials with suspected NORM contamination through NORM surveys including:

- 1. Collection of representative samples for NORM contamination analysis prior to accepting any waste materials suspected of containing NORM; and
- 2. Policies and procedures for ongoing radiation surveys

A representative sample(s) of the material and a NORM radiation survey will be conducted on offshore installations where the material is generated. Samples for radiochemical analysis will be sent to a certified laboratory to determine the activity level in the sample.

A survey meter will be used to measure the radiation dose while and contamination meter will be used to confirm the presence of any radioactivity in a sample or area or for checking for radioactive contamination due to an incident involving radioactive material.

CIS anticipates encountering NORM contaminated scale, sludge & water which will be containerized in sealed containers and/or equipment, including field tubulars, tools, pipes, PPE and scrap metal. Solid waste will be packaged in UN rated 205 Litre 18 gauge carbon steel drums which includes a gasket and 12 gauge bolt ring to secure the contents inside the drum. Liquid waste will be packaged in 205 Litres triple seam steel tight head drum which includes plugs with poly gaskets. The ends of field tubulars (pipe) and other equipment will be sealed with end protectors and wrapped / covered with a strong, flexible, water-resistant or waterproof material.

NORM originating from the oil & gas operators will be transported by supply vessels from offshore installations to dockside locations in St. Johns in the same manner and to same locations that it currently arrives ashore. NORM materials will be collected at shore base using flat deck tractor trailers and / or box trucks and transported to Crosbie Industrial's site where it will be temporarily stored and subsequently transported by flat decks tractor trailers or van trailers to out of Province disposal / decontamination facilities. All NORM materials will be segregated and separately stored away from other materials in appropriate leak proof containers located in the designated storage location.

NORM with activity above 70 Bq/g falls under federal jurisdiction and is therefore subject to the requirements of federal regulations, including the CNSC's Packaging and Transport Regulations and the Transport of Dangerous Goods Regulations for all dangerous goods shipments. Materials that exceed acceptance criteria will be collected at dockside in and shipped directly by approved transporters in accordance with Transport Regulations to out of Province disposal and decontamination facilities.

Quantities and levels of NORM materials stored will be such that annual effective dose limits will not exceed 1 mSv, the limit for incidentally exposed workers and members of the public. As well, storage of NORM will be monitored to ensure that a dose limit of 1mSv will not be exceeded beyond the property boundary of our site.

CIS will develop and maintain an ongoing comprehensive inventory of all NORM contaminated material as it arrives at our site. Each container of waste material will be sampled, analyzed and logged into the tracking system. Results from radiochemical analysis will also be entered into the system. Inventory records will be maintained on the nature of the NORM received and will include the date received, NORM activity level, radionuclides present, container identification, duration of storage, identification of transport carrier, date of shipment out of province. Analytical results for samples of materials conducted by a CAEAL certified laboratory will be kept current and on file and made available to the Department of Environment and Conservation.

Operations will include only the transport of NORM waste, equipment and containers from dockside to CIS's site for temporary storage up to a maximum of 1 year, for subsequent transport out of the province. All sealed containers will remain sealed during transport and temporary storage. There will be no decontamination of NORM contaminated equipment at the CIS facility and there will be no processing of NORM waste received by CIS.

The storage area will be inspected at least daily, and a logbook of the inspections will be maintained. A description of the integrity of the NORM containers will be documented. Deteriorated containers or contained where the integrity may be compromised will be replaced immediately.

The temporary storage of NORM is a light industrial use of the property and is not anticipated to be a frequent activity and will not intensify use of the property.

The operation will be in effect for as long as the services are required from our clients. NORM waste will subsequently be sent for decontamination, disposal or longer-term storage to licensed facilities outside Newfoundland.

Potential sources of contamination during the operation:

<u>Spills of waste materials</u>. The containment systems are designed to contain potential spills within the confines of the systems, land or groundwater contamination should not be an issue. In addition, NORM is typically in the form of a hard fixed scale, and not a loose material, on the interior surface of sealed equipment such a tubular, so the risk for pollution is very low.

Since it is anticipated that only the inner surface and not the outer surface of equipment such as tubulars will be contaminated with NORM, then the equipment pad will provide added protection against a spill or loss to the environment. Emergency response equipment and spill kits are readily available at the facilities and staff is fully trained in the proper use of the spill cleanup equipment.

CIS will receive only NORM equipment and waste that is properly packaged and documented in accordance with regulatory requirements and guidelines.

Crosbie Industrial Services has developed a NORM Management Plan and an Emergency Response Plan to outline a predetermined set of instructions with the aim to provide a prompt and coordinated response to any foreseeable emergency associated with the operation and the storage of NORM. These plans cover the reporting, containment, removal and cleanup of a spill or fire of any material stored on the property. The goal of these plans is to assist in developing a high level of preparedness for response to a spill or fire situation. As well, the objectives of Crosbie Industrial Services' plans include ensuring the safety of employees, contractors and the public, developing an effective incident reporting system and minimizing any potential damage to the environment or the facilities.

Other environmental, safety & security measures include:

- Mandatory load inspections for each shipment;
- Only Transport Canada Approved shipping containers are utilized;
- Ensure that all waste is described accurately on a movement document;
- Non-conforming shipments may be refused;
- Controlled access including sign in/out procedure;
- Temporary storage area will be clearly marked;
- Electronic Gate;
- Security Cameras;
- Combination doors locks;
- Daily visual inspections;
- All materials properly labelled, marked and inventoried;
- On staff Environmental Chemists and Technicians;
- Health & Safety Planning;
- Emergency Response Planning;
- Personnel Protective Equipment;
- Spill response equipment; and
- On staff full time person(s) experienced and knowledgeable in radiation protection to conduct worksite evaluations.

NORM contaminated equipment is typically wrapped with an impermeable liner and transported on flat deck trucks while waste is typically packaged in 205 L sealed steel drums.

CIS and our parent company, Envirosystems Inc., maintain a comprehensive Health, Safety, Environment & Quality program including an auditing program to ensure that all procedures, including the transport, storage and handling of NORM, are implemented.

4.5 Occupations:

Occupations associated with the storage of NORM will not increase and will be incorporated into the responsibilities of Crosbie's existing professional staff.

4.6 **Project Related Documents:**

CIS's NORM Management Plan Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials (NORM)

5.0 APPROVAL OF THE UNDERTAKING

Our existing Certificate of Approval # WMS-07-07-017 dated March 26, 2015 is for the continued operation of a Waste Management System. This undertaking will require a new approval or an amendment to our existing certificate of approval.

6.0 SCHEDULE

The anticipated date for approved commencement of the temporary storage system for NORM is July 27, 2015.

7.0 FUNDING

This undertaking does not depend upon a grant or loan of capital funds from any Government Agency.

An estimate of capital cost associated with the undertaking is \$125,000.

8.0 CONCLUSION

Crosbie Industrial Services, an Envirosystems company, is very committed to this project. An unrelenting commitment to health and safety is the number one priority of every Envirosystems company. A core value that is central to everything we do, from pre-job planning to execution and debriefing, safety is deeply instilled within our culture and permeates throughout all levels of our organization.

At Envirosystems, our goal is to create enduring partnerships with our customers. More than just a service provider, we are invested in our customers' long-term success.

June 30, 2015

Mike Ryan, President, CEO and Vice Chairman Envirosystems Inc. www.envirosystemsglobal.com



OVERNMENT OF NEWFOUNDLAND AND LABRADOR Department of Environment and Conservation CERTIFICATE OF APPROVAL

Pursuant to the Environmental Protection Act, SNL 2002, Sections 16, 78 and 83.

| Issued: Expiration: | March 26, 2015 March 31, 2018 | Approval No.: File No.: | WMS-07-07-017 | | |
|------------------------|---|----------------------------|---------------|--|--|
| Propononi: | Crosbie Industrial Services I P.O. Box 8338 St. John's, NL, A1B 3N7 | Limited | | | |
| Attention: | Mr. Roy Baker | | | | |
| Re: | Collection of Liquid Wastes (Province-Wide) Fixed Oily Water System (St. John's) | | | | |

Approval is hereby given for the continued province-wide operation of a waste management system operation consisting: a) collection of flquid wastes, b.) collection and storage of oily water; and c) permanent oily water treatment unit.

This approval does not release the holder from the obligation to obtain appropriate approvals from other concerned provincial, federal and municipal agencies. Approval from the Department of Environment and Conservation (the Department) shall be obtained prior to any significant change in the design, construction, installation, or operation of the facility, including any future expansion of the works. This certificate shall not be sold, assigned, transferred, leased, mortgaged, sublet or otherwise alienated by the holder without obtaining written prior approval from the Minister.

This approval is subject to the terms and conditions as contained in Appendices 'A, B, C, D and E' attached hereto, as may be revised from time to time by the Department. Appendices 'A, B, C, D and E' forms part and parcel of this certificate of approval. Failure to comply with any of the terms and conditions may render this certificate of approval null and void, may require the proponent to cease all activities associated with this certificate of approval, may place the proponent and its agent(s) in violation of the *Environmental Protectian Act*, SNL, 2002, c. E-14-2, and will make the proponent responsible for taking such remedial measures as may be prescribed by the Department. The Department reserves the right to add, delete, modify or revoke this approval at any time.

MINISTER



Appendix B: Geographic Location





