

The *NORM* Report

Naturally Occurring Radioactive Material Contamination SPRING 96

Index

| | |
|--|----|
| Regulations Update | 1 |
| State | 1 |
| Federal | 6 |
| Canada | 7 |
| CRCPD | 9 |
| Low-Level Waste | 9 |
| MMS - Notice to Lessees | 10 |
| Allwaste Oilfield Serv. | 14 |
| Campbell Wells | 15 |
| Radiation Risk | 16 |
| EPA Response to Radiation Risk | 16 |
| French Recommendation on ICRP 60 | 19 |
| Envirocare | 20 |
| Non-Threshold Model in Historical Context | 21 |
| Meeting Calendar | 23 |
| Amercian Radiation Serv. | 23 |
| Selective Tools | 24 |
| S.E. International | 25 |
| Comparison of St. Rules | 28 |
| NORM Training Course | 29 |

Regulations for the Control of NORM - Update

The states of regulations for the control of NORM is summarized below for 19 states, the federal government and Canada. Significant developments have occurred in Mississippi, Washington, and the Minerals Management Service. Each regulatory agency was contacted during the period from June 4-19.

The last states to enact NORM regulations were New Mexico and South Carolina. Their regulations were summarized in the Summer 1995 issue of **The NORM Report**. Louisiana, Oregon, Mississippi, Arkansas, Texas and Georgia have previously enacted regulations for the control of NORM.

There currently are no federal rules specifically for the control of NORM.

Enactment of regulations specifically for the control of NORM will require compliance by industries and companies with NORM contamination and NORM waste materials. Companies should already be in compliance with state general regulations for the control of radiation and the OSHA radiation regulations.

The status of NORM regulations in all 50 states, the federal government and Canada will be summarized in the Summer 96 issue of **The NORM Report**.

ALASKA

Alaska is preparing a draft proposal to the EPA and other federal agencies for funding to finish writing their NORM regulations. The state has cut the budget for radiation programs and only minimal funding is available.

Alaska does have guidelines which can be used when necessary for disposal of NORM. For example, CEI is working in a pipeyard at Kenai and the NORM wastes will be injected into a disposal well. These guidelines provide a basis for evaluating requests to dispose of NORM resulting from the production of oil and gas within the State. The guidelines apply to material exhibiting gamma radiation levels

greater than 50 microrem per hour as given in API Bulletin E2, first edition, April 1, 1992: *Bulletin on the Management of Naturally Occurring Radioactive Materials in Oil and Gas Production*. These guidelines are:

Requirements for NORM Disposal

Sources for NORM Disposal:

1. Source of NORM material must be from within the State of Alaska.
2. Material type must be scale, scaled tubulars, contaminated soil, basic sediment, sludge, tank bottoms, other RCRA exempt oil & gas waste, etc.

(Continued on page 2)

The *NORM* Report

published quarterly by
Peter Gray & Associates
P.O. Box 470932
Tulsa, OK 74147

Tel: 918/492-5250
Fax: 918/492-4959

E-mail:
pgray@normreport.com

Copyright 1996

ALASKA (continued)

- 3. Disposal volume is to be given in cubic feet, barrels, or length and diameter of tubing string.
- 4. For disposal under these guidelines, the radiation exposure level(s), based on a representative composite sample, must be less than 2,000 microrem per hour (uRem/hr).
- 5. Radiation level(s) must be recorded for each source. Several containers from the same source may be measured as a group and the highest reading used to describe the source.

Disposal Methods and Requirements:

- 6. Below the lowermost USDW, NORM can be slurried and injected into a Class II well.
- 7. NORM can be disposed of in the open-hole section of an AOGCC permitted well provided the lowermost USDW is behind pipe and the NORM is isolated in the wellbore between minimum 100 foot cement plugs, the top of which is at least 100 feet below the lowermost non-exempt USDW.
- 8. Within a cased hole, the NORM must be isolated between minimum 100 foot cement plugs (or cement retainer with a minimum 50 foot cap) the top of which is at least 100 feet below the lowermost non-exempt USDW.
- 9. The casing must be well cemented opposite the upper cement plug, as indicated by a cement quality log, or the casing must be perforated and squeezed with a quantity of cement calculated to provide 150 feet of fill in the annulus based on a caliper quality.
- 10. The top of the upper plug

- must be tagged to confirm location and cement quality.
- 11. The cement plug immediately above the NORM must be color-dyed red with iron oxide or a suitable alternate as approved by the Commission.
- 12. NORM shall not be used as admixtures in cements used for well plugs.

Marking and Reporting:

- 13. The marking plate must contain the word "NORM" in addition to the information required by regulation 20 AAC 25.120 (name of operator, unit or lease name, and well number); for offshore wells, surface markings must be as agreed to by the AOGCC at that time.
- 14. The abandonment report shall contain a section specific to NORM disposal which shall provide "as-built" information pertinent to the criteria listed above.

ARKANSAS

Some changes have been proposed in the Arkansas regulations for the control of NORM. One change proposed will exempt equipment contaminated with NORM if the maximum radiation exposure does not exceed 50 microrem per hour including background at any accessible point.

Other changes proposed include the requirement to make NORM surveys similar to those required in Louisiana.

The legislature has approved the proposed changes which will probably become effective in August or September.

CALIFORNIA

The consensus report detailing the results from the survey of petroleum facilities for NORM contami-

nation in California still has not been released to the general public. In addition to gamma surveys, water, brine, soil and other appropriate samples were taken for laboratory analysis. Both the Department of Health and the Department of Conservation are currently trying to get permission to get the report released to the public.

COLORADO

Envirocare of Utah has sued the State of Colorado and others within Colorado over the disposal of some radioactive waste that had been sent to a solid waste landfill.

Envirocare argues that the waste should have been sent to a disposal site licensed to receive radioactive wastes.

There was a pile of mining wastes near the city of Golden. A water main broke several years ago threatening to flood the tailings pond. EPA came in under its CERCLA authority and removed the tailings pond and its sediments and put it in a pile and ordered a number of parties, including the State of Colorado, to remove it under CERCLA.

The state and the other parties studied the pile and concluded that it was not special nuclear wastes, and it was not low level waste. They did determine there was a very small component of by-product material (uranium tailings) and source material in the wastes. Because the vast majority of this material was other things, the state determined that it was a special solid waste which is a category of solid wastes recognized under state law, and therefore, could go to a solid waste landfill. The EPA agreed and issued an order to the State and the other parties to remove the wastes to a solid waste

(Continued on page 3)

COLORADO (continued)
landfill. This has been done.

Envirocare of Utah sued, arguing that the material cannot be called special solid waste and can only be disposed of in a facility licensed for radioactive material. The State vigorously disagreed.

On February 2, 1996, Envirocare filed a motion for a temporary restraining order. The State filed a motion to dismiss.

On February 5, 1996, Envirocare filed a motion for a preliminary injunction.

On March 10, 1996, the District Court granted dismissal of the suit on jurisdictional grounds.

Envirocare has now filed suit against EPA in federal court.

CONNECTICUT

The Connecticut Department of Environmental Protection (DEP) has prepared a proposal to have a contractor prepare a draft of proposed regulations for the control of low level radioactive wastes, including NORM and NARM.

The proposal is currently undergoing review within the DEP.

FLORIDA

In April the Florida Institute of Phosphate Research approved the state's request to fund a comprehensive study of NORM in the phosphate industry. The Institute, located in Bartow and affiliated with the University of South Florida, selected the Polk County Public Health Unit and a private consulting firm to conduct the 18 month study as a joint project beginning in July. The study will identify and evaluate the extent of occupational and public radiation exposure risks related to phosphate

NORM.

The Florida Advisory Council on Radiation NORM Committee, formed in response to the state's request for recommendations on regulatory approaches to NORM, held its first meeting in April. The committee will report to the Council in October.

In an on-going effort to improve the characterization of NORM in Florida, state personnel have been conducting informal site surveys of NORM generators. Phosphate and heavy mineral sand mining operations in north-central Florida were inspected in May, and oil field operations in the Panhandle region were surveyed in June. Surveys of oil fields located in the southwest part of the state are being planned.

Although Florida does not have specific NORM rules, the state does regulate some NORM. There are specific licenses for about a dozen chemical plants, but only for the chemical side of the phosphate industry where it is known that NORM contamination may exceed radiation protection standards.

GEORGIA

Georgia's regulations for the control of NORM became effective in October, 1994. There have been no changes in the rules since that time. However, the rules and regulations are currently being reviewed and changes proposed for adoption by the Board in December 1996.

ILLINOIS

Illinois's approach to NORM regulations is being reviewed to decide if general NORM regulations should be proposed, or whether rules should be written to address the NORM problems in certain sections of selected industries who have the potential for NORM contamination. No decision as to the

approach to be proposed has been made yet. The Department of Nuclear Safety may go with the approach of identifying known NORM problems and writing specific rules for those problems. As new NORM problem areas are identified, new rules will be written to cover them. This approach may be preferable to generic rules which cover the whole world of NORM and results in too much unnecessary regulations without much benefit. This approach to NORM rule making is the result of reviewing the in-depth comments made on the latest (1994) CRCPD draft. There is no time schedule for the NORM rule making in Illinois.

KENTUCKY

The Department of Health Services is working with the Kentucky Department of Environmental Protection to locate a suitable site for the long term storage of the NORM wastes resulting from the remediation of the Martha Oil Field.

LOUISIANA

It is expected that the new governor may ask for significant reductions in state regulations. However, the reduction has not been officially mandated throughout the state regulatory agencies. There are no immediate plans to make any changes in the Louisiana NORM regulations or in the NORM Implementation Manual.

There have been discussions about removing the NORM manifest requirements from the NORM regulations. The manifest requirements will be replaced with receipt of transfer for movements of NORM equipment and waste. Companies will be allowed to use any method or system (they may choose to continue using the NORM manifest) to comply with

(Continued on page 4)

LOUISIANA (continued)
requirements (e.g., shipping tickets, tracking log, etc.)

The oil and gas industry in Louisiana has had access to economical and accessible disposal of NORM-contaminated equipment and waste. However, this is not true of non-oilfield related NORM wastes such as those found in the petrochemical and chemical industries. The Office of Conservation forbids non-oilfield NORM wastes to be considered for disposal at NOW disposal facilities.

When approached by the petrochemical industry concerning disposal options for their refinery NORM wastes, the DEQ has been unable to provide any options except to send the wastes to Envirocare or US Ecology. Most operators would prefer to send the wastes to hazardous waste or solid waste landfills.

Some large NORM-contaminated sites in Louisiana remain unremediated. There are no provisions in the state NORM regulations mandating clean-up of such sites.

MICHIGAN

Effective April 1, 1996, the Radioactive Materials Program formerly in the Michigan Department of Health has been transferred to the Michigan Department of Environmental Quality.

For the past 1 1/2 years Michigan's Division of Radiological Health in the Department of Public Health has been dealing with some large sites heavily contaminated with radium from luminous aircraft dials of World War II vintage.

In one instance a family had lived in a house for 30 years. During that time, the basement in the house was used in a business calibrating

and refurbishing aircraft instruments for a large warehouse distributor. As a result of opening the gauges and refurbishing the surfaces, the deterioration of these old gauges over the years caused radium to be dispersed throughout the house and the backyard of the house and a neighbor's yard as well.

The family residence has been decontaminated. Decontamination of the two warehouses associated with the business will start this summer.

MISSISSIPPI

Responsibility for NORM in Mississippi is divided between the Department of Health and the Oil and Gas Board. The Oil and Gas Board has authority for NORM at the wellsite (effective July 1, 1995). Once the petroleum leaves the wellsite, the Mississippi Department of Health has continued authority for NORM contamination.

The Department of Health has no new developments in its area of responsibility for NORM. The Department does continue to be heavily involved in NORM.

On August 11, 1995, the Oil and Gas Board issued a proposed Rule 69: *Control of Oil Field NORM*. The rule provides the regulations for the control of oilfield NORM to ensure that radiation exposures of workers and members of the general public are negligible. The rule applies to NORM that has been derived from the exploration and production activities of oil and gas operations within the State of Mississippi.

A public hearing on Rule 69 was to have been held in January. This was postponed until March and at the request of attorneys on both

sides of the issue, the hearing was again postponed until April 2-4, 1996. The changes made to the August draft were summarized in the Winter 96 issue of **The NORM Report**.

Following the three-day public hearing, Rule 69 was adopted by the Oil and Gas Board with only a few minor technical changes. The ruling has been appealed but the rule is expected to be upheld. Oil and Gas Board rulings have been overturned only one time in the history of the Board.

NEW JERSEY

The New Jersey Commission on Radiation Protection is considering proposing remediation standards for radioactive materials. The Commission was directed to establish generic soil cleanup criteria for the remediation of contaminated sites. The criteria for soil standards were to be based on either: (1) an incremental lifetime risk of cancer of one in a million persons exposed, or (2) naturally occurring background levels that are consistently encountered. Details of the proposed standard were given in the Winter 96 issue of **The NORM Report**.

The comment period for the interested party draft of N.J.A.C. 7:28-12, *Remediation Standards for Radioactive Materials*, ended on May 24, 1996. Two public hearings were held in April, 1996. Written and oral comments focused on the derivation of the 15 mrem annual cleanup criteria, the selection of parameter values in the pathway analysis, and the economic impact of the rule. The Bureau of Environmental Radiation is planning to address the comments and propose the rule. There is no estimated schedule set for publication of the proposed rule as yet.

(Continued on page 5)

NEW MEXICO

The New Mexico NORM regulations, Subpart 14: *Naturally Occurring Radioactive Materials (NORM) in the Oil and Gas Industry* became effective August 3, 1995.

A task force from the Oil Conservation Commission has come up with some proposed rule changes to allow for the disposal options that are addressed in Part 14 NORM regulations. There will be a public hearing before the Oil Conservation Commission to consider the proposed changes. Unless unexpected opposition to the proposed changes arise in the public hearing, the Commission is expected to adopt the changes which will become effective 30 days later.

OHIO

Ohio's revised general regulations for the control of radiation are presently being reviewed by a subcommittee selected by the Radiation Control Advisory Council. NORM is included in the revised regulations as part of the preparation for Agreement State status. It is hoped that the revised rules will be finalized by fall.

The proposed rules are not yet available for distribution. By the time they are ready for comment, the Bureau of Radiological Health hopes to have a Web page that people will be able to access by e-mail. The final rules document is expected to be several hundred pages in length.

Although Ohio does have NORM contamination problems in their oil and gas industry, the problems are small when compared with such oil producing states as Louisiana, Mississippi and Texas.

OKLAHOMA

A meeting of the Oklahoma Radiation Management Council was held on June 6. A public forum on the management of naturally occurring radioactive materials (NORM) followed the meeting. The purpose of the forum was to allow discussion of issues and gathering of information on NORM related issues in a less formal setting than the regular Advisory Council format. Two main topics of discussion were disposal options and licensing. The Council received many good comments and concerns from the approximately 30-40 people present. Various industries and the public were represented.

The Council will begin preparing draft 13 of proposed NORM regulations for Oklahoma. They hope to have the draft ready for discussion at the September 5th meeting of the council.

SOUTH CAROLINA

Part IX-*Licensing of Naturally Occurring Radioactive Material (NORM)* became effective June 30, 1995 in South Carolina. There have been no changes in the regulation and none are proposed at the present time.

Part IX was summarized in the Summer 1995 issue of **The NORM Report**.

TEXAS

The Texas Department of Health has jurisdiction for NORM except for the disposal of NORM. The Railroad Commission has jurisdiction for the disposal of oil and gas industry NORM wastes, while the Texas Natural Resource Conservation Commission has responsibility for the disposal of non-petroleum industry NORM wastes.

The Department of Health is still

planning to make some modifications to their NORM rules. The revisions have been delayed because of other higher priority matters. The NORM revisions should be completed during the next year. The changes will primarily be in classifications of NORM and adding some requirements for processing of NORM from other persons. These revisions will be coordinated with the Railroad Commission, particularly where they concern jurisdictional issues or where processing and desizing are being done at the same time.

Statewide Rule 94: *Disposal of Oil and Gas NORM Waste* took effect February 1, 1995. This rule sets forth requirements for the safe disposal of NORM that constitutes, is contained in, or has contaminated oil and gas waste. Rule 94 was summarized in the Winter 95 issue of **The NORM Report**. There are no plans at present to revise Rule 94.

The Texas Natural Resources Conservation Commission has not started drafting disposal rules yet for non-oil and gas NORM wastes. When the general radiation rules from the Department of Health have been revised where necessary, it may be possible to start drafting the NORM disposal rules for the non-petroleum industries.

WASHINGTON

US Ecology filed a lawsuit challenging the 1995 amendments to WAC 246-249-080 which limited the disposal of NARM waste at the commercial low-level radioactive waste disposal facility in Richland to 8600 cubic feet per year.

A settlement agreement between the Washington State Department of Health and US Ecology was

(Continued on page 6)

WASHINGTON (continued) reached on May 15, 1996. Under the Agreement the Department of Health agreed to initiate rulemaking to consider a 100,000 cubic foot limit and US Ecology agreed to dismiss its action. The court has entered an order staying operation of the amendment and imposing a 100,000 cubic foot limit during the pendency of the rulemaking proceeding.

Rulemaking will move ahead, consistent with the requirements of Washington's Administrative Procedures Act. The earliest possible date for public hearings will be the last week of August 1996. Two hearings will be held: one in Richland, and one in Olympia

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

Although radon in occupied structures is generally not a primary concern in NORM industrial contamination, the EPA considers radon emanation from NORM to be one of the most hazardous features of NORM, particularly as it may increase the radon concentrations in nearby structures where people may be working or living.

The Office of Radiation and Indoor Air (who probably will have the responsibility for proposing regulations for the control of NORM) has merged the Radon Division, the Indoor Air Division and the Electromagnetic Fields Program into a new Indoor Environments Division directed by Mary Smith.

Prompting the merger was a decision by new ORIA Director E. Ramona Trovato to combine radon and other indoor-air issues in order to achieve more efficient program management and effective program strategy.

Driving the timing of the merger was a government wide effort to streamline agencies. In the Environmental Protection Agency, the goal was to reduce the ratio of employees to managers to 11:1.

Radon publications are now out there on the Information Superhighway. Those who have access to the Internet can find the publications on the home page of the EPA's Office of Air and Radiation (OAR) and then looking for the Office of Radiation and Indoor Air (ORIA). To be specific, type http://www.epa.gov/oar/oria_ied.html. Available for browsing or downloading are *A Citizen's Guide to Radon*, *Home Buyer's and Seller's Guide to Radon*, *Reducing Radon Risks*, *Consumer's Guide to Radon*, *A Physician's Guide to Radon*, *Radon Measurement in Schools (revised edition)*, *El Radon*, *Model Standards and Techniques for Control of Radon in New Residential Buildings*, *Radon Mitigation Standards*, a list of state radon contacts, and the Consumer Federation of America's *Radon Fix-It Program*.

Also on the Internet are the proficiency listings of certified radon measurers and mitigators. To access the new Radon Proficiency Program, type <http://www.epa.gov/radon-prof/>.

NUCLEAR REGULATORY COMMISSION (NRC)

The NRC continues to monitor NORM developments but is doing nothing specific on NORM at this time.

The NRC and the Agreement states met recently (March 5/6) in Vancouver, Washington. Among the topics discussed were sealed radioactive sources that inadvertently get to scrap dealers in loads of scrap iron and steel. Most of the

scrap dealers send the scrap back to its origin.

Several federal agencies are jointly preparing a manual for remediating a contaminated site for unrestricted use. Although the manual will be for contaminated federal sites, the manual will probably be the basis for state regulations for the remediation of industrial NORM contaminated sites.

The manual is discussed in four papers to be presented at the Health Physics Society annual meeting in Seattle in July. Dr Meck (NRC), one of the authors of the manual, has stated that preparation of the manual began in January, 1994 and should be ready for public comments in November, 1996, depending on the number of comments received during the intra-agency reviews. Further details of the manual are given below.

The Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), the Department of Energy (DOE), and the Department of Defense (DOD--Army, Navy and Air Force) are jointly developing a single federal guidance document for investigating and characterizing sites that have been contaminated with radioactive materials. The multi-agency radiation survey and site investigation manual (MARSSIM) is being written to support implementation of Federal rules, currently under development, for the cleanup of sites contaminated with radioactive materials. The MARSSIM will provide guidance for planning, conducting, evaluating, and documenting environmental and structural radiation and sampling surveys in support of remediation of radioactive contamination. The philosophy, standardized techniques and methodologies

(Continued on page 7)

NUCLEAR REGULATORY COMMISSION (continued)

that form the basis for this manual are consistent with Federal limits, guidelines, and procedures. The sampling and radiation surveys that will be depicted in the manual will only entail the use of commercially available instrumentation and equipment. Survey designs and evaluation of results will incorporate standard statistical approaches.

MINERALS MANAGEMENT SERVICE (MMS)

The Minerals Management Service (MMS) has released their document on guidelines for the offshore storage and sub-seabed disposal of wastes resulting from the development and production of oil and gas in the outer continental shelf. The document is dated May 8, 1996. The document outlines specific guidelines for wastes which contain NORM above background levels.

The guidelines are reproduced herein beginning on page 10.

CANADA

The *Guidelines for the Handling of Naturally Occurring Radioactive Materials (NORM) in Western Canada* was released in August 1995. There are no plans to make the guidelines into regulations at the present time. It is expected that the oil and gas and the fertilizer industries will use the NORM guidelines to develop their own code of operating practices in order to give the front-line workers specific guidelines to enable them to work with NORM safely. Some questions have been raised about the report, particularly on the *de minimis* values used for bulk materials in Tables 2 and 5. I asked the Chairman of the Western Canada NORM Committee responsible for the report for clarification. Dennis Novitsky's comments follow:

To promote the continual improvement of the Western Canadian NORM Guidelines, I would like to offer my personal comments to address the concerns of some of your readers.

To reiterate, the Western Canadian NORM Committee purposefully chose to review and adopt recognized international standards which for this guideline, are embodied primarily by the IAEA and the ICRP. This resulted in the exclusion of some existing Canadian and U.S. standards. This course of action was adopted for three reasons;

1. We wanted to develop a standard which was based on science, not politics, to the greatest extent possible. This "*moral high ground*" was intentional in that national standards setting entities should begin their own unique NORM policy development based upon objective scientific information, formulated by an international pool of experts. As you know, this is not a perfect process but it was the best alternative available to the Committee.
2. Our intent was to provide a comprehensive and consistent pool of information for use by affected industries. Industry members in our Committee had pressing NORM problems to deal with straightaway and needed one set of coherent "standard practices" upon which industry codes of practice could be developed. As a result, the Committee chose to develop a Guideline, not a NORM Standard. Further, the guidelines can be much more quickly amended to reflect our improved understanding of the NORM issue as it continues in its evolution.
3. Not unlike numerous industries, an internationally based set of

NORM guideline is more likely to cross national boundaries. Given the increasingly global nature of business, our industry representatives wanted to develop globally accepted guidelines, recognizing of course, the unique requirements of western Canada political boundaries. Given the infancy of NORM standards development, a more global set of guidelines is more likely to gain acceptance as a credible basis for national and perhaps, international standards development.

In this context, I would now like to address the more specific concerns about the *de minimis* values incorporated in Tables 3 and 5 of the guidelines.

Starting with Table 5, I would like to provide some additional background in the interpretation of the "Diffuse" and "Discrete" columns in the table. Diffuse NORM represents the low concentration, high volume NORM material typically found as an industrial by-product such as in fertilizer production processes. The diffuse NORM exempt activity level for each isotope was developed by IAEA working groups using pathway analysis and based upon internal and external exposure estimates associated with each exposure pathway. This type of analysis was also done by the Commission of the European Communities. In its report "*Principles and Methods for Establishing Concentrations and Quantities (Exemption Values) Below which Reporting Is Not Required in the European Directive*", they describe in some detail, the methodology taken to arrive at their exempt values and the critical pathway (limiting pathway) found in arriving at that value. Some NORM radionuclide exemption limits listed in Table 4

(Continued on page 8)

CANADA (continued)
of the report are shown in the table below.

imposed a 0.001 factor to the IAEA concentration values. Neither the IAEA standard nor the European

est ICRP recommendations. See table at the bottom of this page.

As with aqueous limits, I welcome further discussion on our current radon gas limits in the guidelines.

The intent of the Western Canadian NORM Committee was to develop a set of guidelines that would be treated as a living document. The Western Canada NORM Guidelines represent a tentative first step in progress towards developing a consistent and rational approach to the NORM issue. I welcome the opportunity to dialogue with anyone concerning the Western Canadian NORM Guidelines and extend my appreciation to the editor for this forum.

Dennis R. Novitsky
Health and Safety Consultant
936 Berkley Drive, NW
Calgary, Alberta T3K 1A2
(403) 730-8286

Editor's note:

Radiation and concentration units in the Canada guidelines are in the international system (SI), e.g., sieverts and becquerels. The table below gives the conversion factors for converting SI units to conventional units, e.g., microrems and picocuries.

1 microrem = 100 microsieverts
10 microrem = 1 millisievert

1 picocurie = 0.037 becquerel
27 picocuries = 1 becquerel

| <u>ISOTOPE</u> | <u>ACTIVITY CONCENTRATION</u> | <u>ACTIVITY</u> |
|----------------|-------------------------------|-----------------|
| U-238 | 4.75 Bq/g | 28,400 Bq |
| Ra-226 | 4.67 Bq/g | 4,540 Bq |
| Pb-210 | 5.21 Bq/g | 5,100 Bq |
| Ra-228 | 15.2 Bq/g | 85,500 Bq |
| U(nat) | 1.83 Bq/g | 2,570 Bq |
| Th-228 | 1.50 Bq/g | 8,780 Bq |

These reported results compare quite favorably to our NORM Guidelines values and should be considered in complete agreement given the uncertainties associated with this type of analysis. To the less initiated, these values, if applied blindly and in isolation, could lead to potentially hazardous gamma exposures if the NORM is diffuse and extensive such as in the contaminated soil scenario. However, other standards must be considered including the direct gamma exposure limit of 0.5 μ Sv/h as stated in the guidelines. All applicable standards must come into play when performing a radiological hazard assessment.

In Table 3, for de minimus values of bulk materials, we chose to adopt the "1 IAEA exempt activity concentration" for solids which goes to the heart of my previous comments.

For Aqueous Solutions and Gases, we were compelled to modify the IAEA standards based upon other existing standards.

The IAEA standards implies aqueous activity concentrations, orders of magnitude greater than drinking water standards or permissible discharge concentrations such as those specified for uranium mines. To address this, the Committee

report, explicitly address aqueous concentration limits. Since publication of the guidelines, I have received feedback concerning the aqueous limits. It appears that our 0.001 factor is too conservative and generates concentration values that are extremely difficult if not impossible to measure in the field. Portable analytical gamma spectroscopy equipment requires extremely long measurement periods in order to satisfy minimum accuracy requirements. I welcome any comments and recommendations to improve the aqueous limits in the Western Canadian NORM guidelines.

At the time of publication of the guidelines, the international scientific community was in a state of flux concerning radon gas. The latest ICRP recommendations were not available. We therefore chose to go with the existing Canadian standard. I would like to see our guideline radon concentration limit modified to better reflect the lat-

| | |
|---|--------------------------|
| De minimus (below the lowest public range | <200 Bq/m ³ |
| NORM Contaminated (occupational) | <800 Bq/m ³ * |
| Radioactive (radiation worker) | ≤4.8 WLM |
| *The Canadian standard within the range 500-1500 Bq/m ³ specified by the ICRP. | |

