

A SUMMARY AND HISTORICAL REVIEW OF THE  
RADIOACTIVE CLEAN-UP IN PORT HOPE, ONTARIO

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In the winter of 1976 the words radon gas and Port Hope, Ontario became synonymous. Reporters, camera crews and television people flocked to the area and overnight the situation became news across Canada. For several weeks the news was front page material, highlighted by the forced evacuations of several Pidgeon Hill Drive families and the entire student population of St. Mary's Separate School. The evacuations were prompted by the elevated radon gas levels detected in these structures.

Since that time, the news reports have all but disappeared and only on infrequent occasions do you hear the standard line, "You're from Fort Hope, you must glow in the dark".

For the next 25 minutes or so I would like to review the radioactive clean-up which has taken place here in Port Hope since the winter of 1976 almost four years ago. By the end of my presentation I hope you will have a better idea of the extent and nature of the situation and will have gained some insight into the problems associated with an undertaking of this magnitude.

As many of you are already aware, radon gas is a decay product of the radioactive element radium and, for long periods of exposure, has been linked with lung cancer.

Radium occurs naturally in very minute quantities and the extraction process requires many tons of ore to produce a few grams of pure radium. The extraction processes used in the thirties were generally ninety-five percent efficient and as a result produced tons of extraction residues with trace amounts of radium still intact. It is these residues which are the major source of radon gas in this area today.

Another aspect to be considered in radium extraction is the radioactive contamination of buildings and equipment as a result of direct contact with the process stream. Radium is almost totally an alpha energy emitter, and as many of you are aware, alpha contamination is a very serious problem in terms of ingestion and inhalation.

These two points, namely, the radium extraction residues and the contaminated process equipment and buildings take on more meaning with the following excerpt from the report entitled "The Preliminary Investigation of the Technical and Economic Factors for the First Stage Remedial Measures at Port Hope, Ontario," which was prepared by James F. MacLaren Ltd. for the Atomic Energy Control Board in April, 1976.

' In 1932, Eldorado Gold Mine Limited commenced operation of a plant in Port Hope, Ontario, to process the ores mined at Port Radium Northwest Territories for the recovery of radium. In 1944 the company was taken over by the Canadian Government and renamed Eldorado Mining and Refining Ltd.

The first residues from the radium recovery operation were produced in 1933 and were disposed of on the plant site from 1933 to 1939. During the period 1945 to 1948 these residues were reprocessed and the waste disposed of at the Monkey Mtn. Residue Area in Port Hope.

From 1939 to 1944 residues were deposited in the Lakeshore Residue Area. This area is a short distance to the west of the plant and is adjacent to a railway embankment just south of the CNR freight shed (since demolished). In the latter part of the 1939 - 1944 period, the nature of the residue changed as the plant processes were altered from radium extraction to the production of uranium. Approximately 4,000 to 5,000 tons of radium extraction residues were removed from the Lakeshore Residue Area in 1957 and 1958 and sold to Vitro Corporation in the United States for the recovery of other metals, the remaining residue was transferred to the Port Granby Disposal Area, ten miles west of Port Hope.

The Monkey Mountain Residue Area within the Town of Port Hope was used from 1945 to 1948 for the disposal of residue and large quantities were removed from this site and disposed of at Port Granby in 1959 and 1956. Some 800 tons of this residue were sold to Deloro Smelting and Refining Co. in 1959.

From 1948 to 1974 the Pidgeon Hill Storage Area was used for the storage of contaminated equipment and radium waste, and some incineration of combustible wastes was carried out prior to 1954 but no burial of waste was made on this site.

There were several periods during which there was an active building programme on the Eldorado property. In 1938 and 1939 a building which had contained the original radium processing plant set up in 1932 was demolished. The refining of radium ceased in 1953 and in the following two years the radium laboratories were dismantled and buried at the Welcome Residue Area. In 1954 and 1955, the old radium circuit was removed and a new solvent extraction circuit installed; at about this time several other buildings were demolished. In 1959 the original main office building and the uranium processing building were demolished.

All of these actions produced building rubble, fill and reclaimed building material, any of which might have been contaminated and which may have been used in the Town for various purposes.'

From this brief historical background one can see the two aspects of the resulting situation; one - radon gas from the radium residues and two - radium contaminated building materials salvaged from the old plant.

In the early spring of 1976 a campaign was initiated by the Atomic Energy Control Board, Eldorado Nuclear and the Ontario Ministry of Health (new Ministry of Labour) to survey the entire town for radioactive contamination and to test the radon gas levels in all occupied structures. The surveys were carried out street by street and house by house with a total of approximately 3,500 properties being investigated. Of this total 550 homes were found to have elevated radon gas levels and/or above background levels of radiation.

Detailed surveys carried out as part of the remedial works over the past 3 1/2 years have classified approximately 150 of the initial 550 properties as no work sites. Of the remaining 400 remedial work sites approximately 150 were classed as having above criteria radon gas levels; 280 had exterior gamma levels above criteria and 220 had interior contamination of one form or another. The original 550 properties investigated are highlighted in red on the aerial map of the town.

The initial reports estimated 70,000 to 100,000 tons of low level radioactive waste would require removal and disposal as a result of the Port Hope Remedial activities. The search for a suitable disposal area for this estimated quantity of material identified a site at Chalk River Nuclear Laboratories, approximately 250 miles north and east of Port Hope.

With the acquisition of the Chalk River site a temporary storage area was required in order to stock pile material prior to its "long haulage". Eldorado Nuclear allowed the use of the old Crane plant site for this purpose. Initially the contaminated material was stored inside the old factory building to provide containment and control any runoff. The interior of the building however was quickly filled so an outside concrete pad had to be pressed into service and an asphalt berm was constructed around the pad to prevent runoff. During the winter months the pile was covered with a special polyethylene and fabrene cover.

Over the first winter approximately 2,500 cubic yards of material were stored inside the Crane building and 5,000 yards were outside covered on the concrete pad.

In the fall of 1976 the long haulage of the fill material to Chalk River commenced operation. The long distances to be travelled dictated that tractor trailer type vehicles be used - each carrying an average of 35 tons of material. Following three years of haulage, the Chalk River site had been filled to capacity with 104,225 tons of radioactive fill. The long haul operation had to be shut down in August 1979 after 2,492 trips.

The following series of slides depict the remedial work undertaken to date. The first series of slides deal with the Monkey Mtn. disposal area. Remedial work was initiated at this site in the fall of 1976, however, when it was realized that the quantity of material to be removed was much greater than originally estimated - it was decided that this effort should be redirected towards removal of contaminated material around occupied homes.

A little east of the site, remedial work was initiated on both sides of the street where surface runoff from the Monkey Mountain residue area resulted in surface contamination and elevated radon gas levels in the homes. As the slides depict excavation in many cases was to the depth of the footings and even below. However, surface runoff was not the only method of transport. A large percentage of this residue fill material was indiscriminately dumped in areas throughout the town where clean fill material was required. Low lying backyards, driveways, marshy areas, ravines, etc. all were candidates for the radioactive fill.

Such was the case of St. Mary's School, where the side of an existing ravine was extended with all types of fill material from many of the local industries including the refinery. An addition to the school was later built on this fill material.

As a result of the depth and extent of this material the remedial work involved both interior and exterior excavation. Over 8,000 tons of material were removed from around the exterior and almost 4,000 tons were removed from the interior of the school. The following series of slides depict some of the highlights of this remedial work carried out at St. Mary's School.

The next series of slides are typical examples of exterior excavations carried on throughout the town as part of the remedial works program.

The residue material in addition to its use as fill, also made an excellent subfloor drainage medium, especially when combined with waste material from the Crane sanitary casting plant. The remedial work required for most of these cases was the removal of the entire basement floor and excavation of the material beneath, sometimes to a depth of 24 - 30 inches below the existing floor slab.

One aspect of these remedial works which is overlooked most often is the removal and replacement of contaminated building materials found in some two hundred homes. The most common article to be replaced has been three- and four-inch diameter steel pipes which have been used as support columns for floor joists.

The list of things removed however, is quite varied and includes such things as wooden floor joists, wall studs, brick chimneys, concrete block foundations, steel lockers, rock wool insulation, doors, door frames, windows and window frames, steam heating pipes, stair treads, hand rails, floor coverings and wooden laminated beams. The list of contaminated personal items removed with the owner's consent and not replaced is almost as varied - with such things as ore and yellowcake samples, radium dialed war surplus compasses and aircraft instruments, tool boxes, used laboratory equipment and one interesting article; cloth flowers covered in a radium solution which would glow in the dark at parties. These flowers are shown in this slide.

In several structures the levels of interior contamination and the extent of the contamination from the basement to the attic have dictated that the only practical method of decontamination be demolition of the entire structure and disposal at Chalk River. Over 15 structures (whether in the form of houses or garages) have been demolished and shipped to Chalk River for disposal.

One example of such a demolition was a century-old home on Dorset St. W., pictured here. Another home just a block south of this Legion building currently awaits demolition, however a disposal site has not been available since the closing of the Chalk River site.

But demolition is not the only solution to these extensively contaminated buildings. One structure in particular, which had been used as a storage facility for radium salt solutions, was decontaminated using sophisticated techniques and health physics practices typical of those at Chalk River Nuclear Labs. These slides show some of the actual decontamination operation - the workmen are clad in two sets of protective clothing, rubber gauntlets and boots and are wearing full face army type respirators.

In these pictures they are bush hammering a thin layer of the surface off the poured concrete foundation walls. The contaminated air at the work face is continuously filtered using a 1,000 scfm fan coupled to pre- and absolute filters.

To date compliance files on 441 properties have been submitted to the Atomic Energy Control Board for testing. This summer approximately 20 sites will undergo some form of remedial work including two properties, only recently discovered, with contaminated block foundations. These buildings are approximately two miles outside of the town limits and were discovered prior to their sale during a special request survey for the AECB.

Remedial work on these smaller sites has been made possible by the Town of Port Hope providing James F. MacLaren with an area in which to operate a licenced temporary storage compound which is located at the town's water pollution control centre.

However, remedial work on the larger open areas will have to be temporarily suspended until another suitable disposal area can be put into operation.

I hope my brief talk this morning has been informative and has made you a little more aware of exactly what remedial work has gone on here in Port Hope for the past 3 1/2 years.