RADIOACTIVITY ASPECTS OF THE PROPOSED NIOCAN PROJECT

Dr. Douglas B. Chambers

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The Niocan Project - 1

- Located at Oka Quebec, close to the former St. Lawrence Columbium Site (SLC)
- Niobium ore mined underground
- Processed on surface to produce niobium concentrate … then ferroniobium

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The Niocan Project - 2

- Tailings (residues) from ore concentration are placed in existing pits at SLC and underground
- Slag (scorie) from Niocan is placed underground and encased in cemented backfill
- Slag from SLC will be moved to Niocan and placed underground

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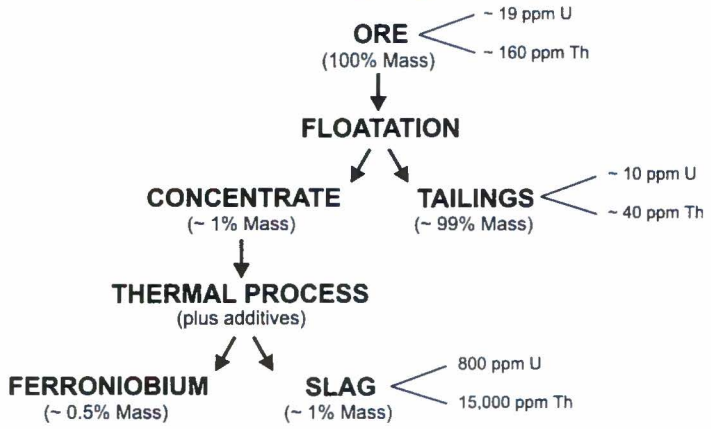
The Niocan Project - 3

The Ore is Slightly Radioactive



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Radioactivity Issues at Niocan

- Natural radioactivity
- Radon in Air
- Dust in air
- Radioactivity in water
- Agriculture

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Natural Radioactivity -1

- Everything is radioactive
- Humans are exposed to natural radioactivity via:
  - Inhalation
  - Terrestrial radiation from rocks and soils
  - Internal from ingestion and inhalation
  - Cosmic radiation

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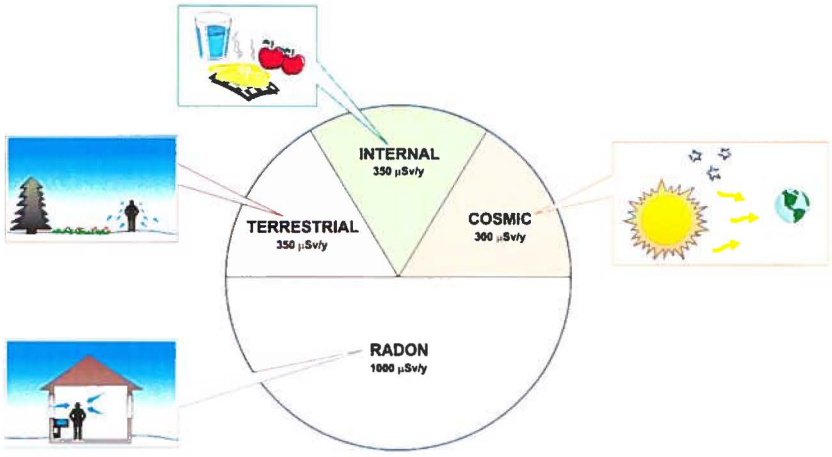
Natural Radioactivity - 2

Approximate Natural Exposures in Canada



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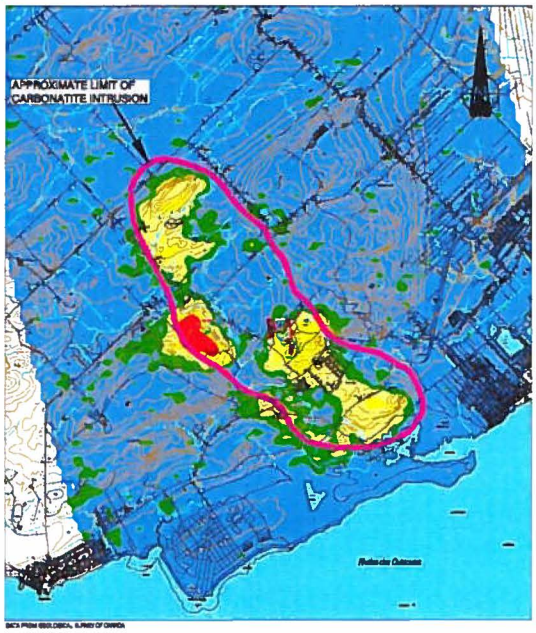
Natural Radioactivity - 3

Uranium in Oka



LEGEND

EQUIVALENT URANIUM *(ppm) IN OKA QUEBEC

0 ppm 2 ppm 4 ppm 10 ppm 30 ppm

* EQUIVALENT URANIUM VALUES BASED ON 350 m LINE SPACED AIRBORNE GAMMA-RAY SPECTROMETRY SURVEY OF OKA, QUEBEC

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Radon in Air - 1

- Niocan
  - Mining
  - Surface processing
  - Flooding
- Natural background

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Radon in Air - 2

- Mining
  - Breaking ore
  - Minewater
  - Exposed surfaces
  - Total: ~10^5 Bq/s
- Surface processing
  - ~10^3 Bq/s
- Waste disposal
  - Slag: nil
  - Tailings: within background
- Carbonatite (background)
  - ~ 8 x 10^5 Bq/s

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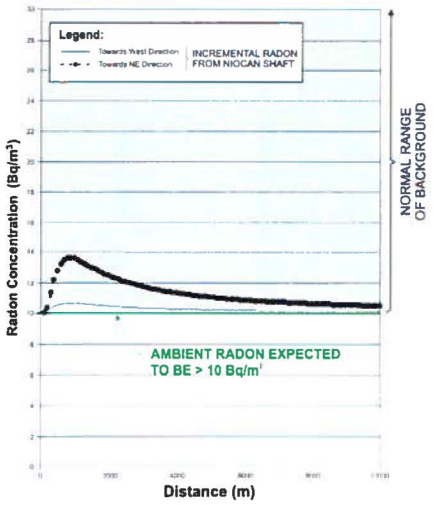
Maximum Radon Concentrations for Emission of 100,000 Bq/s From Niocan Shaft



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Airborne Dust - 1

- Mine ventilation
  - ~ 0.03 kg uranium/year
  - ~ 0.2 kg thorium/year
- Surface processing
  - ~ 0.58 kg uranium/year
  - ~ 12.1 kg thorium/year

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Airborne Dust - 2

- Agricultural (200 ha of tilled fields over carbonatite)
  - ~ 1- 4 kg uranium/year
  - ~ 5 - 19 kg thorium/year
- Relocating SLC slag to Niocan
  - ~ 0.02 kg uranium/year (3 year period)
  - ~ 0.44 kg thorium/year (3 year period)

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Water Quality - 1

- Quebec drinking water limit is 20 μg U/L
- Domestic wells (Régie Regionale, 1999)
  - Most show low uranium
  - For Zone 2 (27 wells over Oka formation), average uranium is 17 μg/L, with 1 in 4 above 20 μg/L
  - For Zone 3 (25 wells away from carbonatite), average uranium is 11 μg/L

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Water Quality – 2

- Slurry of crushed ore and water
  - 8 μg U/L
- Potential seepage from mine well within natural levels and below 20 μg/L

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Agricultural - 1

- Oka soils (Geological Survey of Canada)
  - Average uranium over carbonatite 5.3 ppm (65,000 mBq/kg)
  - Average thorium over carbonatite 23.8 ppm (97,000 mBq/kg)
- North American soil range (nominal)
  - 4,000 - 140,000 mBq/kg uranium
  - 4,000 -130,000 mBq/kg thorium

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Agricultural - 2

- On average, radioactivity in Oka soils in range of soils elsewhere
- Incremental soil uranium and thorium due to 17 years of deposition (at maximum location) from Niocan << average over carbonatite
- Incremental soil concentration from Niocan small compared to natural radioactivity

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Conclusion

- Incremental radioactivity from the mining and processing of niobium ores at Niocan is small and indistinguishable from natural background levels

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