

NUCLEAR WASTE MANAGEMENT

OMAA BOARD OF DIRECTORS

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OTTAWA, ONTARIO

nwmo

NUCLEAR WASTE
MANAGEMENT
ORGANIZATION

SOCIÉTÉ DE GESTION
DES DÉCHETS
NUCLÉAIRES



Ontario Métis Aboriginal Association

INTRODUCTION OF GUESTS & PARTICIPANTS

- **FRANK PALMATER**- WOODLAND METIS TRIBE
- **R. JACK FALKINS** -NATIVE TRADING HOUSE
- **DONNA PAWLOWSKI** -NUCLEAR WASTE MANAGEMENT ORGANIZATION

USED NUCLEAR FUEL



Uranium
Fuel Bundle



Uranium Fuel
Pellets

USED NUCLEAR FUEL

- After about 18 months the used nuclear fuel is removed from the reactor
- Fuel contains 2 types of radioactive nuclides
 - ◆ Fission products (radiation & heat)
 - ★ i.e. strontium 90 -half life 29 years
 - ◆ Actinides (heavy elements)
 - ★ Uranium 235-half life 710,000,000 years
- Radioactivity levels decline rapidly, then tails off
- After 1 million years like natural uranium

WHY IS USED NUCLEAR FUEL HAZARDOUS?



PROBLEM AREAS

■ Radioactivity

- ◆ Ionizing radiation can change molecular structures including tissue of living organisms
- ◆ Exposure to high levels over short/long period can disrupt the body's natural repair processes and cause uncontrolled cell growth (cancer)

■ Heat

- ◆ 25,500 watts of energy when removed from reactor

■ Toxicity

- ◆ Chemically toxic elements like lead

CURRENT MANAGEMENT

‘ Interim storage’ currently used in Canada

- ◆ Water-filled pools for 7-10 years
- ◆ Sometimes into dry storage containers

Centralized storage in Sweden,

- ◆ Pools or dry storage

Reprocessing facilities

- ◆ Then returned to country of origin with the waste

Canadian Nuclear Safety Commission (CNSC)
oversees the whole process



MONITORING

- CNSC
- CANADIAN ENVIRONMENTAL ASSESSMENT ACT
- INTERNATIONAL ATOMIC ENERGY COMMISSION
 - ◆ Monitor risks to people & environment
 - ◆ Accounting for all used fuel
- ***1.72 million spent fuel bundles 2002***
- ***3.6 million estimated future inventory***

TECHNICAL METHODS

KEY TERMS

■ ***DISPOSAL***

- ◆ Method to isolate used fuel from humanity & environment with no intention of retrieval or reuse

■ ***STORAGE***

- ◆ Method to maintain used fuel in manner that allows access under controlled conditions, for retrieval or future activities

■ ***TREATMENT***

- Processes applied to used nuclear fuel that change its characteristics
- Reduce the volume
- Separate the components for individual treatment
- Reduce radiotoxicity (transmutation)

LIMITED INTEREST OPTIONS

■ *Direct Injection*

- ◆ No control; Retrieval impossible; Technical unknowns

■ *Rock Melting*

- ◆ Theoretical only; feasibility & viability are in question

■ *Sub-seabed Disposal*

- ◆ Dilution & buffering effects mitigate effect
- ◆ International conventions & political opposition

- ***Disposal at Sea***

- Prohibited under international conventions

- ***Disposal in Ice Sheets***

- Meltdown, anchored emplacement, surface storage
- Little work done on this concept to date

- ***Disposal in Subduction Zones***

- Put in the descending plates of earth's crust offshore
- Prohibited by international conventions

- ***Disposal in Space***

- Small amounts of the most toxic substances
- No major research
- Challenger/Columbia accidents

- ***Dilution & Dispersion***

- Dissolve in acid
- Neutralize the solution
- Discharge slowly into the sea
- No containment or isolation
- Prohibited by International Conventions



INTERNATIONAL ATTENTION METHODS

■ *REPROCESSING, PARTIONING & TRANSMUTATION*

Current research across the world

Successful transmutation would lower time horizon of risk

■ *STORAGE OR DISPOSAL AT INTERNATIONAL REPOSITORY*

Simple, stable, isolated geological environment

Political opposition: financial risks: costs/benefits

• ***EMPLACEMENT IN DEEP BOREHOLES***

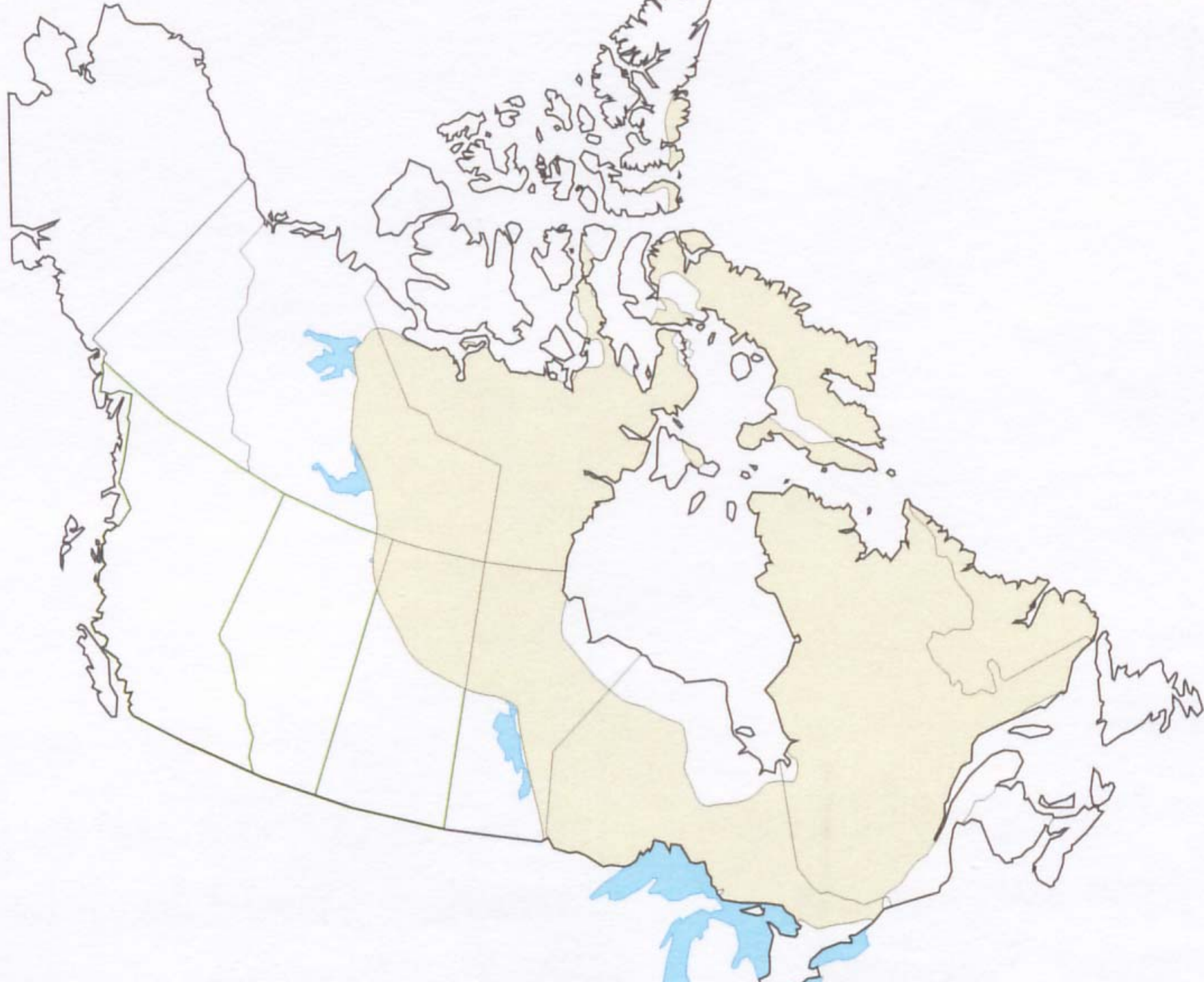
- Solid packaged waste buried in deep borehole kilometers into the ground
- Stacked and separated by cement
- Top 2 kilometers are cement
- Sweden, Russia & Finland have examined concept
- Significant technical questions require further research

METHODS REQUIRING REVIEW

- *DEEP GEOLOGICAL DISPOSAL*
- *CENTRALIZED STORAGE*
- *REACTOR SITE EXTENDED STORAGE*

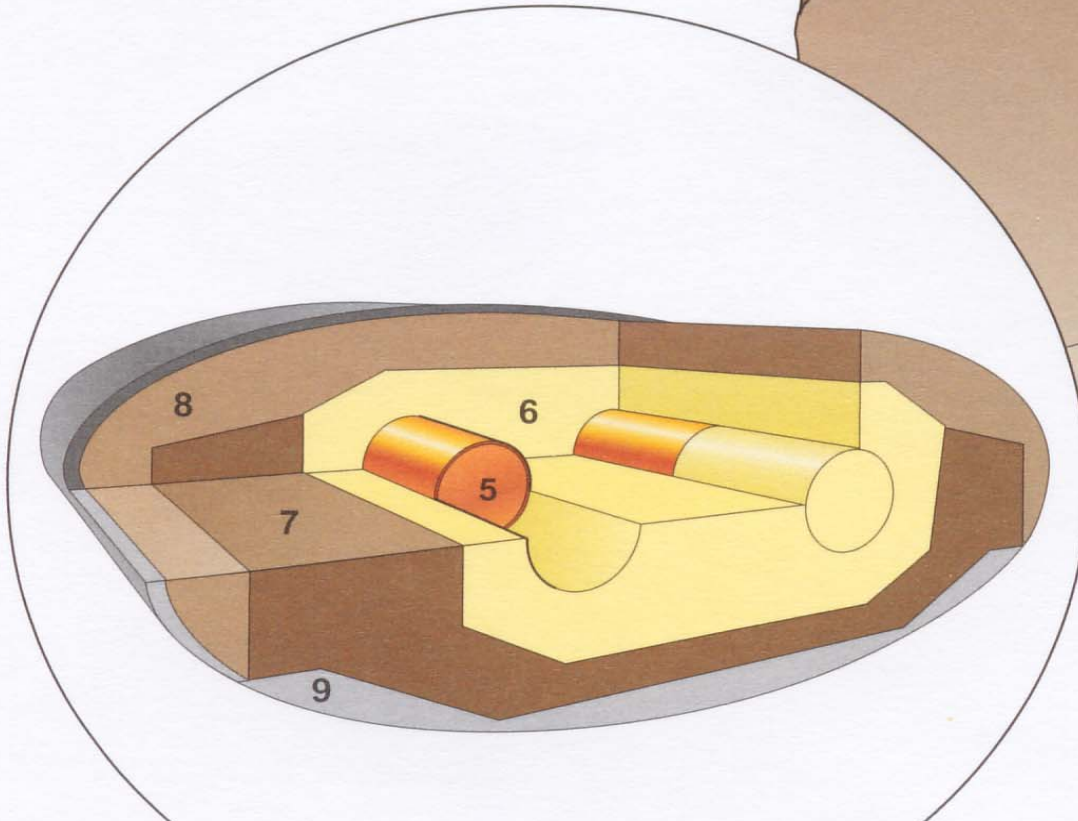
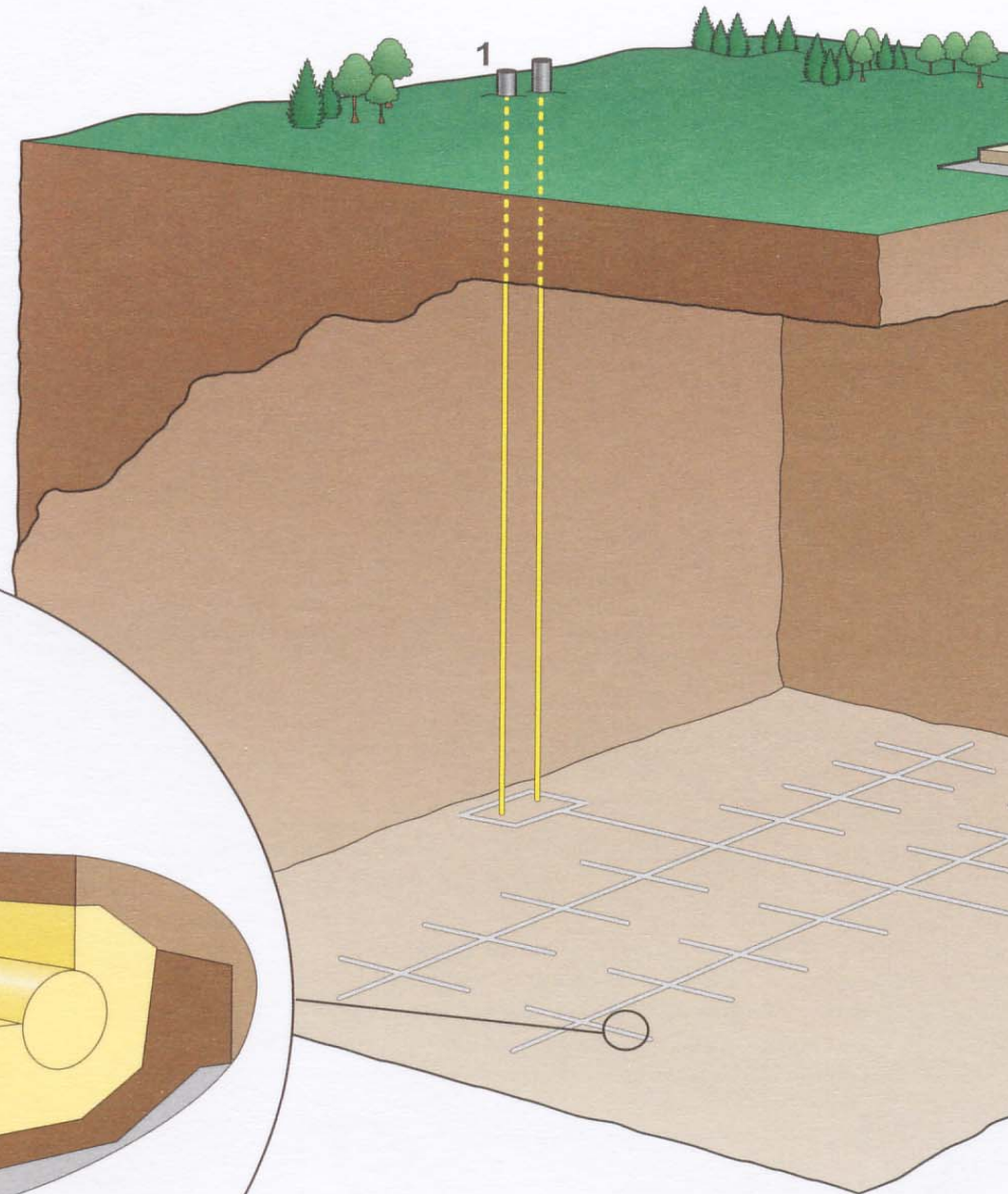
DEEP GEOLOGICAL DISPOSAL

- Bury deep underground
- Currently favoured by most countries & agencies
- Challenge is to limit migration of contaminants
 - ◆ Primarily thru groundwater flow systems
- Use of multiple barriers to limit movement
 - ◆ Packaging, buffer zones, host medium



1. Ventilation Shafts
2. Surface Facilities
3. Access Shafts
4. Subsurface Facilities

5. Used Fuel Container
6. Buffer
7. Dense Backfill
8. Light Backfill
9. Concrete Floor

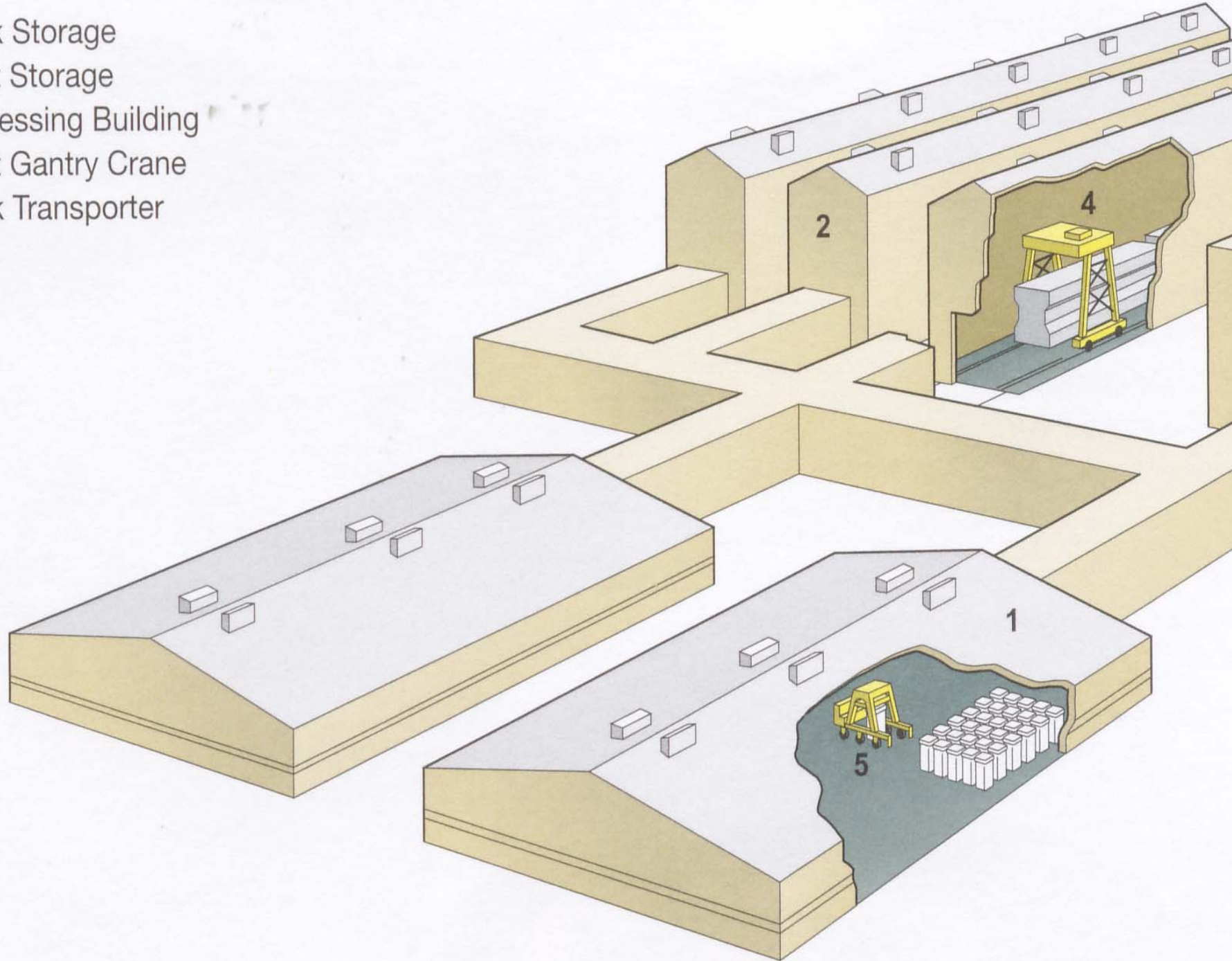


- Sealing repository
 - ◆ Staged approach
 - ◆ Final approach
- Further research required
- Technical change may transpire
- Monitoring how effectively the system is functioning

CENTRALIZED STORAGE

- Access for retrieval under controlled conditions
- Requires the transport of used fuel from reactor sites
- Storage above or under ground
 - ◆ Issues of durability/longevity
 - ◆ Shallow burial or in caverns
 - ◆ Casks or vaults

1. Cask Storage
2. Vault Storage
3. Processing Building
4. Vault Gantry Crane
5. Cask Transporter



REACTOR -SITE EXTENDED STORAGE

- Currently operating in a number of sites
- Mostly above ground storage

Some below ground pools

Advantages

- ◆ Eliminate transportation issues
- ◆ Smaller facilities



The Analytical Framework: The Key Questions

Institutions & Governance	Does the management approach have a foundation of rules, incentives, programs & capacities that ensure all operational consequences will be addressed for many years to come?
Engagement & Participation in Decision-Making	Does the management approach provide for deliberate and full public engagement through different phases of the implementation?
Aboriginal Values	Have aboriginal perspectives and insights informed the direction, and influenced the development of the management approach?
Ethical Considerations	Is the process for selecting, assessing and implementing the management approach one that is fair and equitable to our generation, and future generations?
Synthesis & Continuous Learning	When considered together, do the different components of the assessment suggest that the management approach will contribute to an overall improvement in human and ecosystem well-being over the long term? Is there provision for continuous learning?

The Analytical Framework: The Key Questions

Human Health, Safety & Well Being	Does the management approach ensure that people's health safety and well-being are maintained (or improved) now and over the long term?
Security	Does this method of dealing with used nuclear fuel adequately contribute to human security? Will the management approach result in reduced access to nuclear materials by terrorists or other unauthorized agents?
Environmental Integrity	Does the management approach ensure the long term integrity of the environment?
Economic Viability	Is the economic viability of the management approach assured and will the economy of the community (and future communities) be maintained or improved as a result?
Technical Adequacy	Is the technical adequacy of the management approach assured and are design, construction and implementation of the method(s) used in the management approach based on the best available technical and scientific insight?

ABORIGINAL PARTICIPATION



PARTICIPATION TO DATE

- North Bay : March 4 & 27, 2004
- Ottawa: March 8, 2004
- Saskatoon: September 24-25,
2003

WHY????

- Many aboriginals are in close proximity to nuclear power plants/research centres
- Many hold traditional territory in areas that may be considered for storage or disposal
- During the Seaborn panel deliberations many representatives did not have sufficient opportunity to study/review proposals
- Proposals did not incorporate traditional ecological knowledge

TRADITIONAL MANAGEMENT PRACTICES

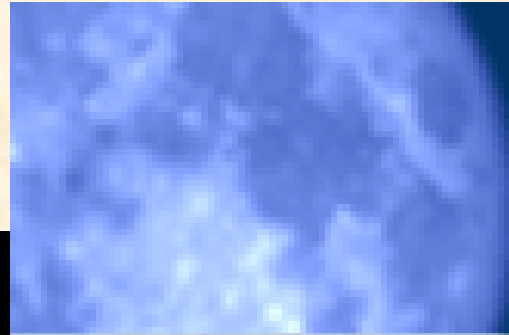
The 5 Principles

- *RESPECT*
- *HONOR*
- *CONSERVATION*
- *TRANSPARENCY*
- *ACCOUNTABILITY*



OTHER PRINCIPLES

- Consideration of the prophecies
- Sharing with each other and Mother Earth
- Use of elders for advice & guidance
- Participation of all not just a few
- Collective not individual benefits for both short and long term matters that affect the whole community
- Learn from the past



HOLISTIC APPROACH

"When the Earth is sick, the animals will begin to disappear, when that happens, The Warriors of the Rainbow will come to save them.".....Chief Seattle



CONSIDER THE IMPACTS

- *ON THE SPIRITS*
- *ON THE WILDLIFE*
- *ON THE MEDICINES*
- *ON ALL LIFE NOT
JUST HUMANS*



TRADITIONAL DECISION MAKING PROCESSES

- ELDERS/WISEST SPEAK FIRST
- PRAYING FOR ASSISTANCE TO MAKE GOOD DECISIONS
- THE WHOLE COMMUNITY INVOLVED
- ALL FACTORS ARE CONSIDERED
- AUTHORITY OF THE PEOPLE WAS ENFORCED
- CONSEQUENCES OF BREAKING TRADITIONAL LAWS IS UNDERSTOOD

CONSIDERATION OF THE IMPACTS ON FUTURE GENERATIONS

7

GENERATIONS TEACHINGS

WE ARE
THE
OLDER
BROTHER
ON THIS
GREAT
ISLAND...



TRADITIONAL ENVIRONMENTAL KNOWLEDGE

- **Complex & sophisticated system of knowledge drawing on centuries of wisdom & experience**
- **Constantly growing & changing with new information**
- **People are part of and the guardians of the land**
- **Encompasses biophysical, economic, social, cultural and spiritual aspects of the environment**
- **Emphasis on inter-relationships between all the components of the environment**

TK USES

- **Provide information on various physical, biological & social components of a particular landscape**
- **Assist to establish rules for using them without damaging them irreparably**
- **Clarify and enhance relationships amongst the users**
- **Assist in the development of technologies for using them to meet the subsistence, health, trade and ritual needs of local people**
- **Help to create a view of the world that incorporates and make senses of all of the above in the context of a long term & holistic perspective in decision making**

A WORKING DEFINITION OF TRADITIONAL KNOWLEDGE

- What would it be?
- Suggested model from Saskatoon meeting

TK RESEARCH

■ FINDINGS IN SASKATOON

- ◆ Support community research capacity building
- ◆ Initiated & controlled by the community
- ◆ Carried out by aboriginals
- ◆ Acknowledge cultural & spiritual context of TK
- ◆ Secure permission from the holders
- ◆ Build trust & respect
- ◆ Respect need for intellectual property protection
- ◆ Make it comprehensible to all

TK & NWMO PROCESS

- Need to find a way to give back to Mother earth and heal the damage both physically & spiritually
- Active Aboriginal participation at each stage
- Ensure that treatment & interpretation of TK is undertaken in manner based on respect & cultural awareness
- Emphasize traditional stewardship relationship

WHERE DO WE GO FROM HERE?

- **CONSULT WITH WHOLE COMMUNITY NOT JUST THE LEADERS**
- **ENSURE RIGHTS ARE NOT BREACHED**
- **EMPOWER COMMUNITIES THROUGH THE PROCESS**
- **CONSULT WITH ELDERS**
- **MAKE THE INFORMATION UNDERSTANDABLE TO ALL**
- **RESPECT EXISITING MANAGEMENT STRUCTURES**