OPG DGR Stakeholder Information Session

December 2, 2016

OPG Offices at Pickering Town Center
1340 Pickering Parkway, Pickering, On, L1V 0C4
And
NRCAN Offices at Sir William Logan Building
580 Booth St., Ottawa, ON, K1A 0E4

Time	Activity
9:00 a.m.	Welcome / Opening Remarks
9:05 a.m.	Introductions
9:10 a.m.	***Presentation: Alternate Locations Environmental Effects***
9:40 a.m.	Q&A and Discussion
10:10 a.m.	***Presentation: Off-site Transportation***
10:40 a.m.	Break
11:00 a.m.	Q&A and Discussion
11:20 a.m.	***Presentation: Cumulative Effects and Mitigation Measures***
11:50 a.m.	Q&A and Discussion
12:20 p.m.	Wrap up and Final Comments
12:30 p.m.	Adjournment

OPG DGR Stakeholder Information Session

December 2, 2016

Federal Review Team - Participants List

Name	Affiliation	Attendance
Jerry Keto	OPG	In person
Gord Sullivan	OPG	In person
Donna Pawlowski	OPG	In person
Alex Iliescu	OPG	In person
Fred Kuntz	OPG	In person
Kevin Powers	OPG	In person
Andrew Muller	OPG	By teleconference
Chris Lledo	OPG	By teleconference
Vasilie Bostan	OPG	By teleconference
Paul Gierszewski	NWMO	In person
Mihaela Ion	NWMO	By teleconference
Alyson Beal	Golder Associates	In person
Mike Jones	CNSC	In person
Candida Cianci	CNSC	In person
Michael Ilin	CNSC	In person
Matt Herod	CNSC	In person
Nana Kwamena	CNSC	In person
Hemendra Mulye	CNSC	In person
Kevin Ji	CNSC	In person
Grant Su	CNSC	In person
Shizhong Lei	CNSC	By teleconference
Rajesh Garg	CNSC	By teleconference
Isabelle Turcotte	Canadian Environmental Assessment Agency	In person
Sara Eddy	Fisheries and Oceans Canada	In person
Caroline Boros	Fisheries and Oceans Canada	In person
Liliana Gwizdkowska	Environment and Climate Change Canada	In person
Jesica Moreno	Environment and Climate Change Canada	By teleconference
Sandro Leonardelli	Environment and Climate Change Canada	By teleconference
Rob Dobos	Environment and Climate Change Canada	By teleconference
Wendy Wilson	Health Canada	In person
Aurelia Thevenot	Health Canada	By teleconference
Kitty Ma	Health Canada	By teleconference

Regent Dickey	Major Projects Management Office	In person
Jennifer Dorr	Natural Resources Canada	In person
Kathleen Hollington	Natural Resources Canada	In person
Jason Kenney	Natural Resources Canada	In person

OPG's Deep Geologic Repository Project – Response to the Minister's Requests

December 2, 2016

DGR Stakeholder Information Session

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Information Session Details

- Welcome and Introductions
- Safety
  - Emergency exit locations
  - Evacuation procedures
- Location of bathrooms
- Food and beverages
- Silence cell phones please
- Overview of materials in folder

Introduction to the Deep Geological Repository

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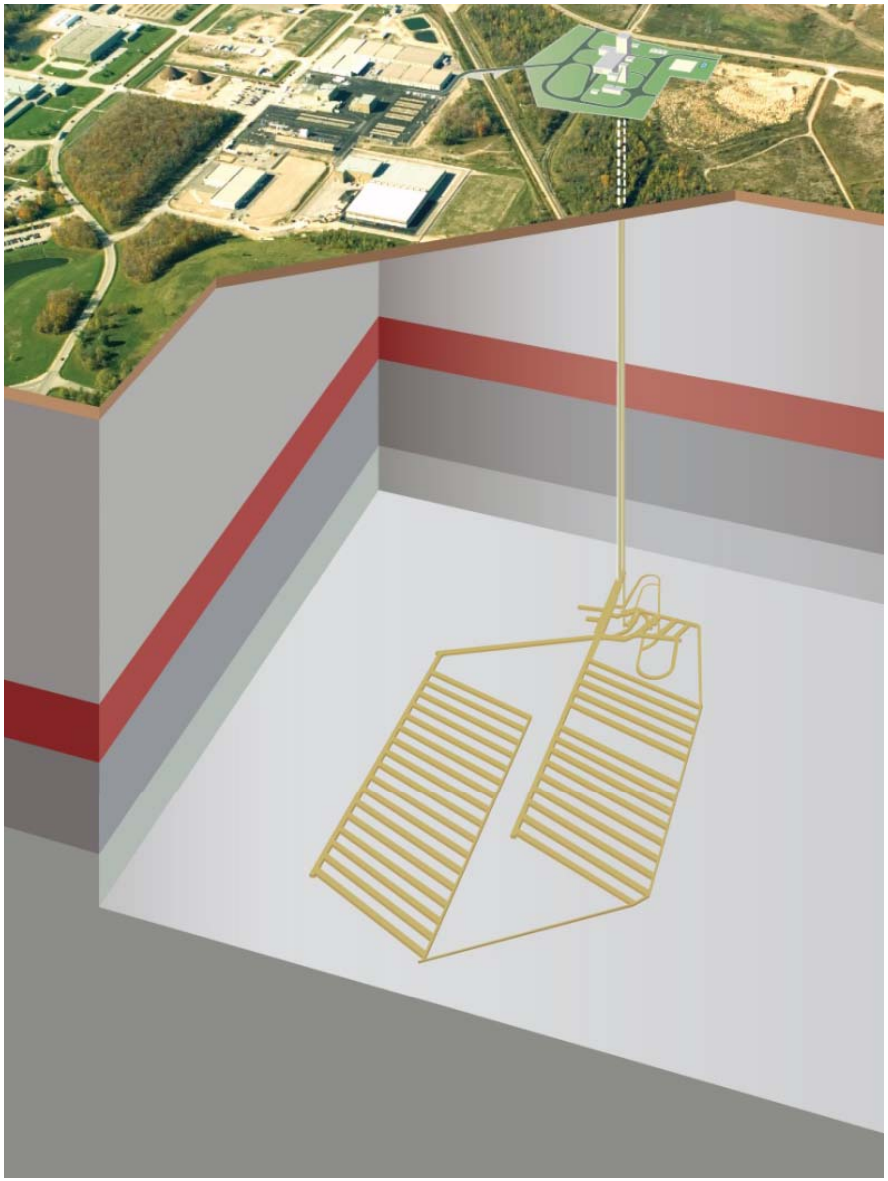
OPG's Deep Geologic Repository (DGR)



- OPG's plan for the long term management of its nuclear waste, is a Deep Geologic Repository at the Bruce Nuclear site.
- The DGR will safely store all low and intermediate level waste from OPG's nuclear facilities 680 meters underground in an impermeable geologic formation.
- OPG is currently seeking Regulatory Approval for the Project

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Background

- 2011
  - Following years of studies, OPG submitted a 15 volume Environmental Assessment report
  - Federally appointed independent Joint Review Panel established
    - Four years of technical reviews and 33 days of extensive public hearings
- 2015
  - The Panel concluded *"that the project is not likely to cause significant adverse environmental effects "* and stated that*:*
    - The Bruce Nuclear site is appropriate
    - Worker and public health and safety will be protected
    - The DGR project will not affect Lake Huron

- 2016
  - Federal request for additional information:
    1. Study the effects of alternate locations;
    2. Analyze the cumulative effects of locating a used fuel repository close to OPG's DGR; and
    3. Update the list of OPG's commitments to mitigate any identified effects.
  - OPG will complete the work and submit information by December 31, 2016
- 2017 - Decision on EA/Construction Licence (TBD)

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Today's Session

- OPG response to the Minister's Request:
  - Package #1:
    - #1a Study of Alternate Locations – Environmental Effects
    - #1b Study of Alternate Locations – Incremental Transportation Costs and Risks
  - Package #2: Updated Cumulative Effects and
  - Package #3: Consolidated Mitigation Commitments
- OPG continues to work on the study requested by the Minister. Please note that any of the discussion points offered today are subject to change and may vary for the purposes of OPG's final submission.

Information Request #1a
Study of Alternate Locations – Environmental Effects

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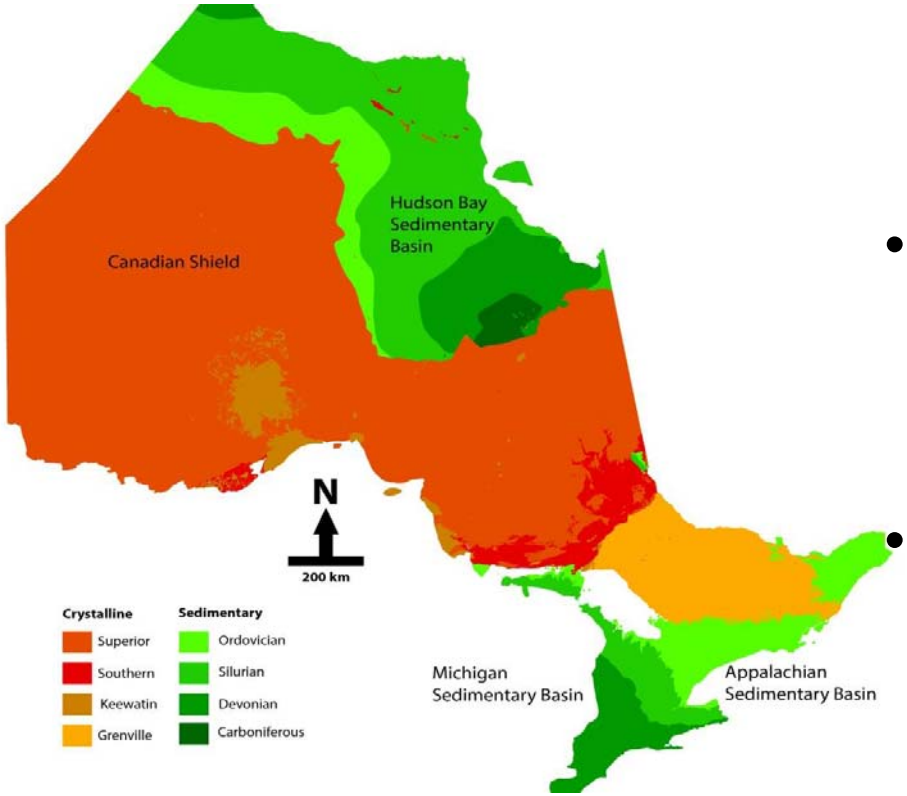
#1 Study of Alternate Locations



- OPG's study examines locations in two geologic regions :
  - A sedimentary rock formation; and
  - A granite rock formation
- Economic and technical feasibility criteria were developed
  - Thresholds applied where applicable
- Reference locations were described, representative of key environmental features in those regions
  - Consistent with feasibility criteria

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Feasibility Criteria: Technical

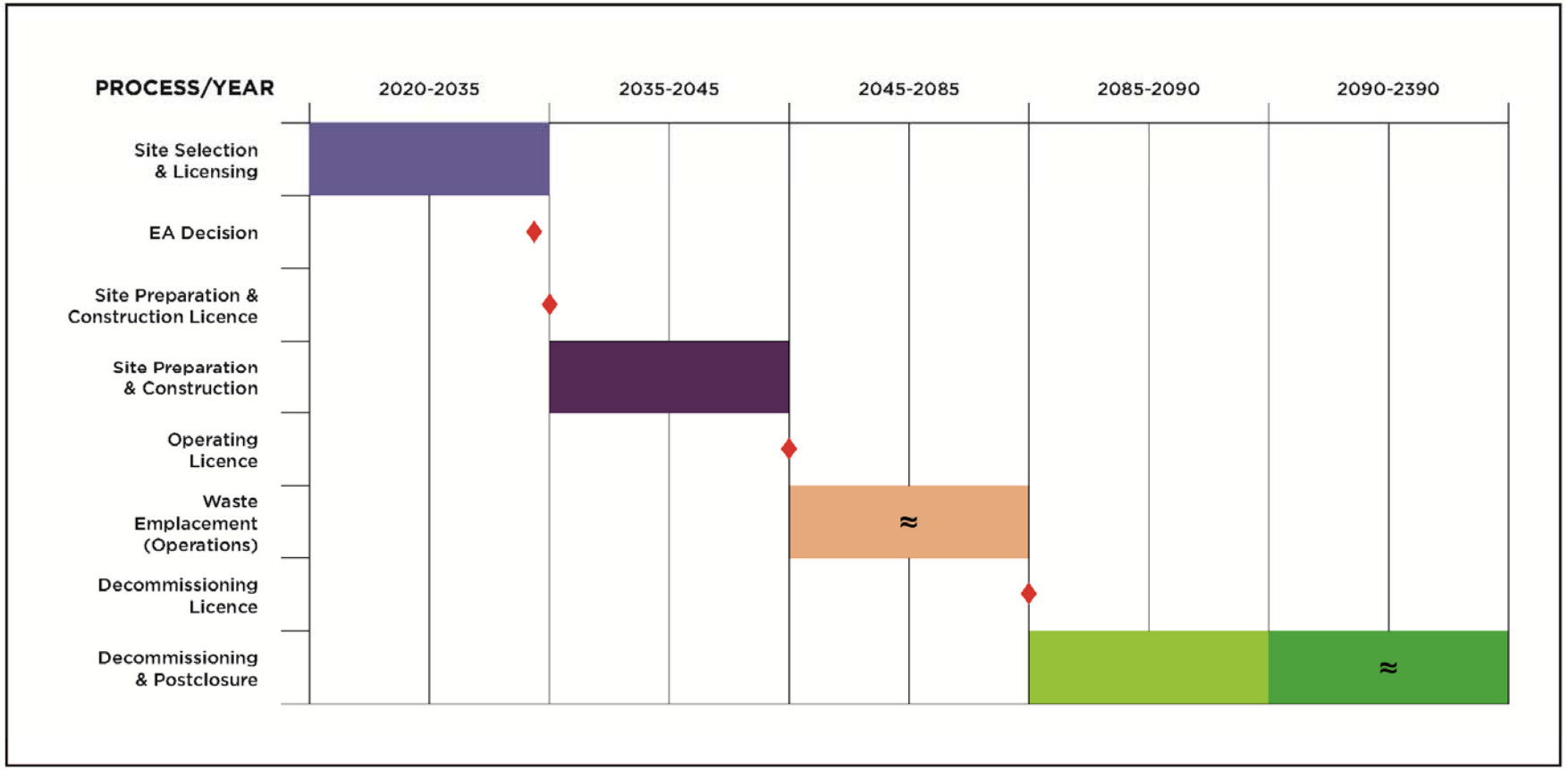
Technical Criteria	Rationale	Evaluation Factors
Is there suitable host rock?	Can the host rock support long-term containment and isolation?	The volume of competent rock is sufficient to host and enclose the repository. The hydrogeological, geochemical and geomechanical characteristics of the host rock promote containment and isolation of the wastes. The host rock is geologically stable and resistant to expected geological and climate change processes. The geological setting supports site characterization. The strength and geomechanical properties of the rock are favourable for construction and operation of underground facilities.

Feasibility Criteria: Thresholds

- Technical Feasibility
  - Sufficient rock volume for a repository holding 200,000 m^3 of as-packaged wastes, and for future doubling of capacity.
  - Host rock mass has low hydraulic conductivity such that contaminant transport in the rock mass is very slow.
  - Host rock compressive strength greater than the in-situ rock stresses.
  - Chemically reducing conditions at repository depth.
  - Seismically quiet location.

The Alternate Project - Phases and Timelines Sedimentary Location

2045 Sedimentary Location



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The Alternate Project – Basis for Effects Assessment

- Same base project works and activities as for DGR Project at Bruce Nuclear site
- Incremental works and activities associated with:
  - Design and implementation of a site selection process;
  - Acquisition of property (240 – 900 ha)
  - Additional site infrastructure (e.g., security, power, access)
  - Transport of waste containers to alternate location
  - Receipt and temporary storage facilities for containers at alternate locations
  - Additional activities at WWMF for extended storage
    - Not included in effects assessment but considered an incremental cost

Key Environmental Features

Sedimentary Alternate Location

- Geology is comprised of a layer of glacial drift, overlying thick sequences of sedimentary rock, which sit upon crystalline basement bedrock
- Fractures are expected to be sparse
- Hydraulic conductivity profile similar to that of the Bruce site
- Area of low seismic hazard
- Small rivers or streams in the vicinity.
- Repository facilities not located within 120 m of provincially significant wetland

Crystalline Alternate Location

- Geology is defined by a layer of glacial drift, and lake and river sediments (i.e. clay, silt and sand) overlying the crystalline rock
- Typically fractured, the repository design may require engineered barrier systems
- Trend for decreasing hydraulic conductivity with depth in the Canadian Shield.
- Low seismic hazard
- Numerous small water bodies in the area as is typical of the Canadian Shield, defined wetlands cover a small percentage of the surface area. Some areas may be transiently wet in the spring.
- Repository facilities not located within 120 m of provincially significant wetland
- Surface water quality generally good with limited human influence.

Environmental Effects – Valued Components

Environmental Component	Valued Component (VC)
Atmospheric Environment	Air quality Noise levels
Surface Water	Surface water quality Surface water quantity and flow
Aquatic Environment	Aquatic habitat Aquatic biota
Terrestrial Environment	Vegetation communities, including upland and wetland Wildlife habitat and biota
Geology and Hydrogeology	Soil quality Groundwater quality Groundwater flow
Radiation and Radioactivity	Humans Non-human biota
Land and Resource Use	Use of lands and resources

Screening for Potential Interactions
Aquatic Environment Sedimentary Location

Project Works and Activities DGR at Alternate Location	Aquatic Environment	
	Aquatic Habitat	Aquatic Biota
Site Selection and Licensing		
Site Preparation	•	•
Construction of Surface Facilities	•	•
Excavation and Construction of Underground Facilities	•	•
Transportation of Waste Packages to DGR		
Above-ground Transfer of Waste		
Underground Transfer of Waste		
Decommissioning and Closure	•	
Postclosure of the DGR Facility		
Presence of the DGR Project		
Waste Management		
Support and Monitoring of the DGR Life Cycle		
Workers, Payroll and Purchasing		

Environmental Effects
Sedimentary Location – Aquatic Effects

- Aquatic Habitat and Biota
  - Location is generally well drained. Most watercourses are cool to coldwater and are considered to be more sensitive to disturbances than warmwater systems.
  - Effects on the aquatic environment are most likely during the site preparation and construction phase.
  - Assumes no encroachment on wetlands or streams, although some supporting habitat for aquatic species such as burrowing crayfish may be removed.
  - Changes to water quality may affect aquatic habitat and biota throughout construction and operations phases.
    - Discharge to a small, local receiving waterbody is assumed.
    - Discharges would meet criteria established considering aquatic toxicity thresholds.

Environmental Effects
Sedimentary Location – Aquatic Effects

- Aquatic Habitat and Biota
  - Blasting activities have the potential to cause an indirect on aquatic VCs through changes in vibrations levels.
    - Blasting management strategies would be employed to minimize predicted levels at aquatic spawning habitats in the region.
    - Blasting management plan would be established to ensure vibrations levels during blasting are protective of applicable Fisheries and Oceans Canada (DFO) thresholds.
  - Mitigation measures for aquatic habitat also expected to be protective of biota
  - Considering mitigation, no significant effects on the aquatic environment are likely.
    - Mitigation requirements may be slightly higher in magnitude discharging to a smaller waterbody.

Environmental Effects: Sedimentary Location – Aquatic Effects

Valued Component	Effects as Compared to DGR	Mitigation Requirements	Comments
Aquatic Habitat	↔	▲	Effects on aquatic habitat are likely to be similar at both sites The magnitude of effects may be slightly higher, or additional mitigation may be required, at the alternate location if discharged to a smaller watershed.
Aquatic Biota	↔	↔	Effects on the aquatic environment are likely to be similar at both sites

Environmental Effects: Crystalline Location – Geology and Hydrogeology

Project Works and Activities DGR at Alternate Location	Geology and Hydrogeology		
	Soil Quality	Groundwater Quality	Groundwater Flow/ Transport
Site Selection and Licensing			
Site Preparation	•	•	•
Construction of Surface Facilities		•	•
Excavation and Construction of Underground Facilities			•
Transportation of Waste Packages to DGR			
Above-ground Transfer of Waste			
Underground Transfer of Waste			
Decommissioning and Closure	•	•	•
Post-closure of the DGR Facility	•	•	•
Presence of the DGR Project			
Waste Management	•	•	•
Support and Monitoring of the DGR Life Cycle	•	•	•
Workers, Payroll and Purchasing			

Environmental Effects: Crystalline Location – Geology and Hydrogeology

- Site Preparation and Construction Phase
  - Hydrogeology has the potential to be affected by site preparation and construction activities.
  - Potential effects relate to construction dewatering and the resulting zone of influence due to pumping and management of pumped groundwater, which will have direct and indirect effects on overburden and shallow bedrock groundwater quality and solute transport.
  - Construction of additional site infrastructure to access the site may also have an interaction with shallow groundwater flows.
    - Taking into consideration the variable bedrock terrain in the region, excavation or blasting for road cuts may be required.
  - Localized dewatering may be required in the vicinity of excavations.

Environmental Effects: Crystalline Location – Geology and Hydrogeology

- Operations and Post-closure phase
  - During operations, the project has the potential to continue to affect groundwater flow from dewatering of underground facilities; however, volumes of water to be managed are likely to be much smaller during operations, and therefore, the potential for effects further reduced.
  - Active groundwater flow in bedrock is generally confined to shallow localized fractured systems, and is dependent on the secondary permeability associated with the fracture networks.
  - Groundwater flow at depth at a crystalline rock location may exhibit some advective flow through a fracture network, in zones where fractures are present, rather than exhibiting entirely diffusion dominated flow.
    - Additional mitigation may be required as part of the crystalline rock location
  - Potential effects are also identified during the postclosure phase.
  - Given the expected groundwater flow regimes in a crystalline rock environment in central or northern Ontario, a DGR Project in a Crystalline Location is unlikely to result in significant adverse effects on geology and hydrogeology.

Environmental Effects: Crystalline Location – Geology and Hydrogeology

Valued Component	Effects as Compared to DGR	Mitigation Requirements	Comments
Soil	↔	↔	• Effects on soil quality are expected to be similar between sites
Groundwater Quality	↔	▲	• Residual effects on groundwater quality are expected to be similar between sites; however, additional mitigation may be required as part of the crystalline rock location
Groundwater Flow	↔	▲	• Residual effects on groundwater flow are expected to be similar between sites; however, additional mitigation may be required as part of the crystalline rock location

Environmental Effects Overall Findings

- Increased Environmental Effects include:
  - increased effects on air quality, including greenhouse gases, during waste transportation from the WWMF to the alternate location
  - increased effects on noise levels due to likelihood of quieter background levels at the alternate locations
  - adverse effects on vegetation communities from increased clearing during site preparation and construction of surface facilities and supporting infrastructure, including access roads
  - adverse effects on wildlife communities due to establishment of a new site with associated indirect effects from vegetation loss and habitat fragmentation
  - effects on traditional and non-traditional land use due to establishment of a change in land use, traffic from waste transport and workers, and indirect nuisance-related effects relative to background levels

Information Request #1b
Incremental Transportation Costs and Risks

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Transportation Study - Scope

- Focus of the Transportation Study
  - To determine the incremental costs and risks for transporting the entire inventory of L&ILW on public roads to Alternate Locations
  - The complete inventory of waste at 2045/2055 is stored in approximately 54,000/57,000 containers
  - The total volume of LLW is ~ 138,000/146,000 m3
  - The total volume of ILW is ~ 10,000/11,000 m3

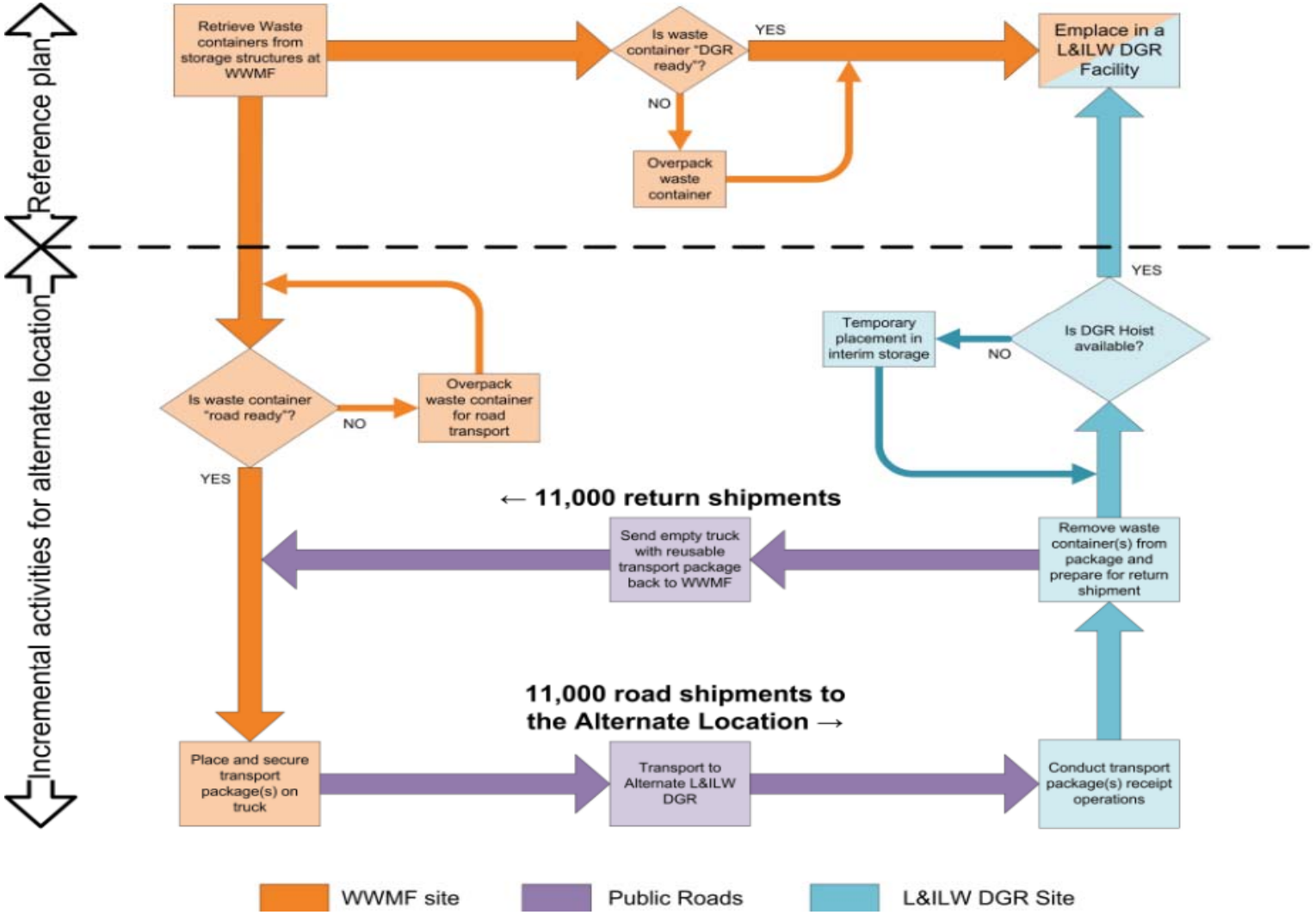
Key Planning Assumptions

- All shipments are made by truck transport on public roads
- Transportation schedule aligned with retrieval activities
- Activities considered in this report comply with CNSC, Transport Canada, and MTO requirements for packaging type and specifications
- Waste characteristics assumptions aligned with current L&ILW DGR Safety Case
- This estimate is a Class 5 Estimate according to AACE classification
- Four distances considered
  - 100 km, 500 km (2045 DGR in service date);
  - 1000 km, 2000 km (2055 DGR in service date)

Cost Estimating Methodology

- Costs included in the estimate are limited to the incremental costs for:
  - Packaging for transportation
  - Road transportation from WWMF to Alternate Locations (labour, tooling, and equipment)
- Waste Category grouping used to assimilate the common characteristics to simplify methodology.
  - Determine the nature and number of transport packagings
  - Re-packaging was added where required to render containers “road ready”
- Cost estimate developed for each of the 12 waste categories (4 LLW and 8 ILW)
- Cost adjustment factors are used for each waste category to account for uncertainties

Reference Plan vs Incremental Activities for Alternate Location



LLW Waste Categories

WWMF		LLSB (DGR Ready):		LLSB (Not DGR Ready):	
2045	2055	2045	2055	2045	2055
LLW Volume: 138,000 m3	LLW Volume: 146,000 m3	40,895 containers 5,546 shipments	44,077 containers 5,944 shipments	6,437 containers 1,288 shipments	

Bruce SG Segments:		Trench Waste:		HX Segments:	
2045	2055	2045	2055	2045	2055
416 segments 416 shipments		1,926 containers 241 shipments		31 intact HX's 31 shipments 20 HX segments 20 shipments	

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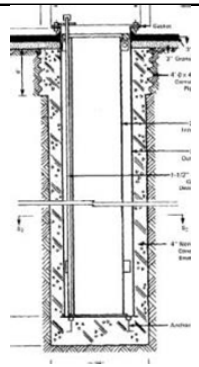
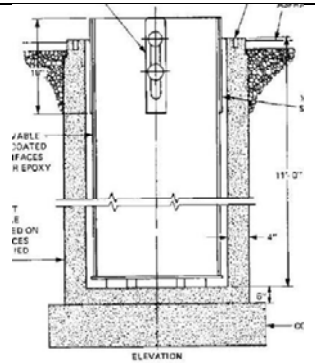
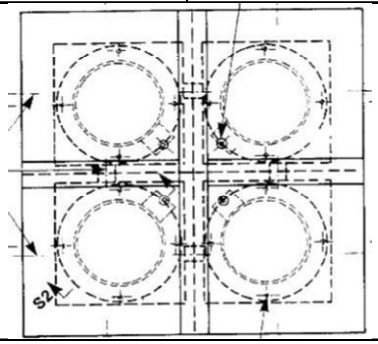
ILW Waste Categories - 1

					
WWMF		**IC-2 TH with Fixed Liners:**		**IC-2 TH with Removable Liners:**	
2045	**2055**	**2045**	**2055**	**2045**	**2055**
ILW Volume: 10,000 m3	**ILW Volume: 11,000 m3**	**17 containers 17 shipments**		**66 containers 66 shipments**	
					
Quadricell Storage Units with Resin Liners:		**IC-18 with THEL:**		**IC-12/IC-18 Resin Liners:**	
2045	**2055**	**2045**	**2055**	**2045**	**2055**
115 resin liners 98 shipments		**616 containers 616 shipments**	**698 containers 698 shipments**	**2083 resin liners 1770 shipments**	**2289 resin liners 1945 shipments**

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ILW Waste Categories - 2

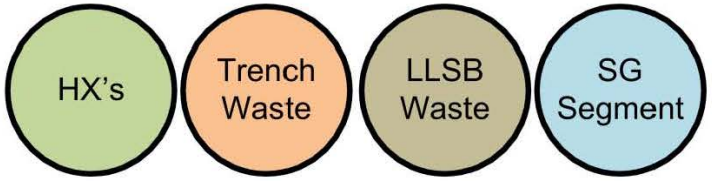
		
Grouted Tile Hole Liners:	**Bruce RWCs**	**Darlington RWCs**
2045 / **2055**	**2045** / **2055**	**2045** / **2055**
43 containers **43 shipments**	**712 containers** **712 shipments**	**474 containers** **474 shipments**

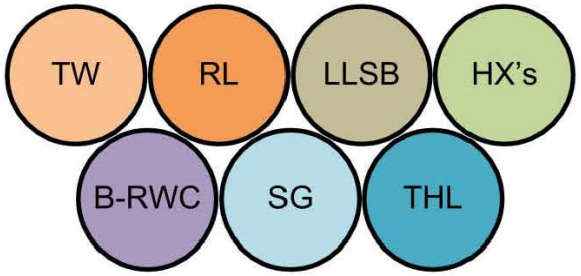
Transport Packagings

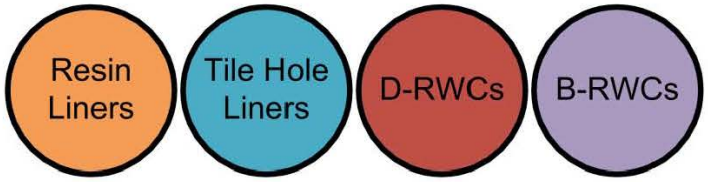
Fig 1: Type IP2

Fig 2: Type A

Fig 3: Type B







SG:	Steam Generator Segment	HX:	Heat Exchanger Waste
LLSB:	Low Level Storage Building waste	TW:	Trench Waste
D-RWC:	Darlington Retube Waste Container	RL:	Resin Liner
B-RWC:	Bruce Retube Waste Container	THL:	Tile Hole Liner

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Container Outbound Shipments

Containers 2045	Containers 2055	Type of Packaging	Shipments 2045	Shipments 2055
44,753	47,616	 Fig 1: Type IP2	6,787	7,155
5,995	6,399	 Fig 2: Type A	1,447	1,531
3,104	3,306	 Fig 3: Type B	3,104	3,306
53,851	**57,321**		**11,338**	**11,992**

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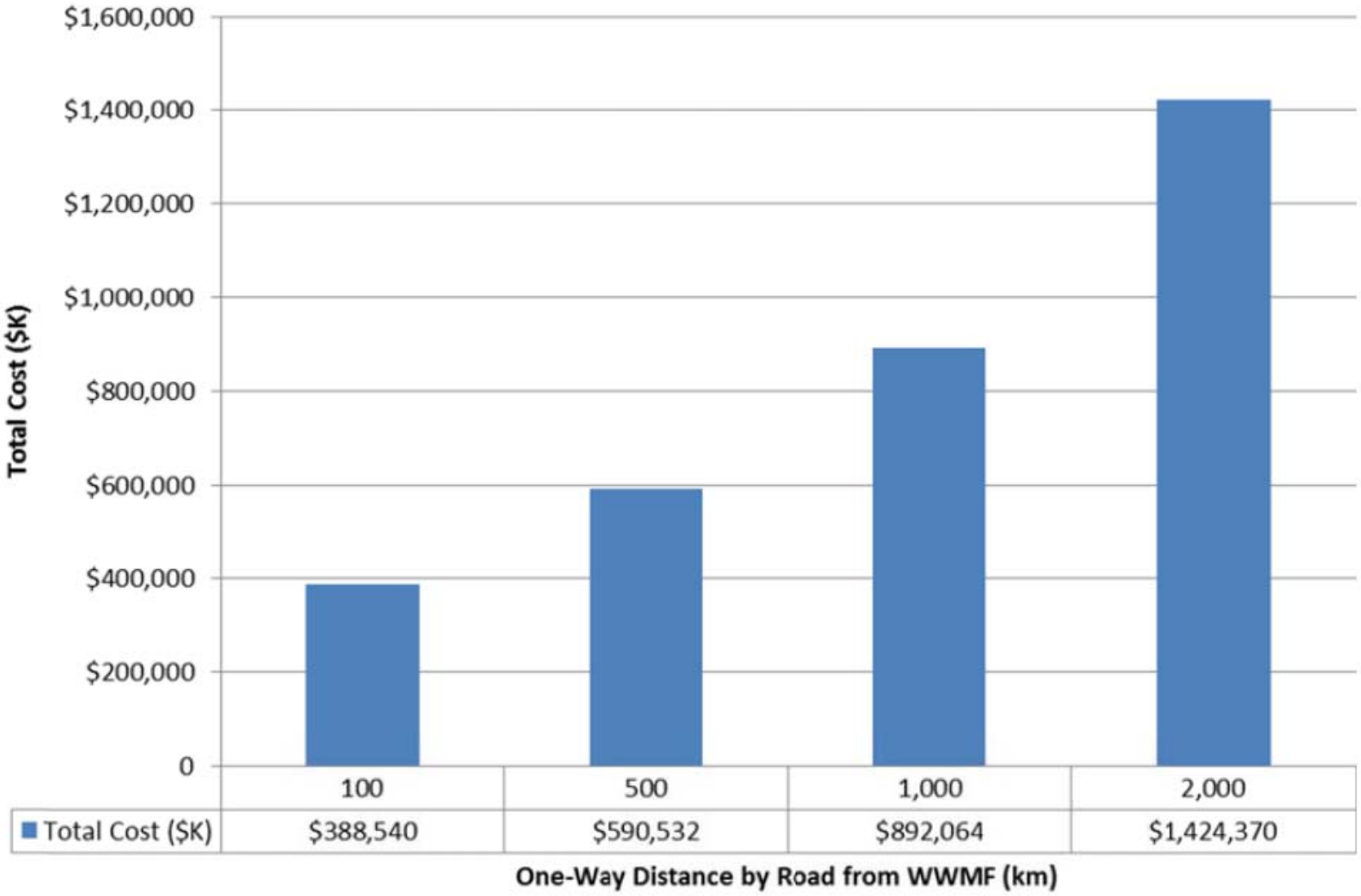
Total Incremental Packaging and Transportation Costs



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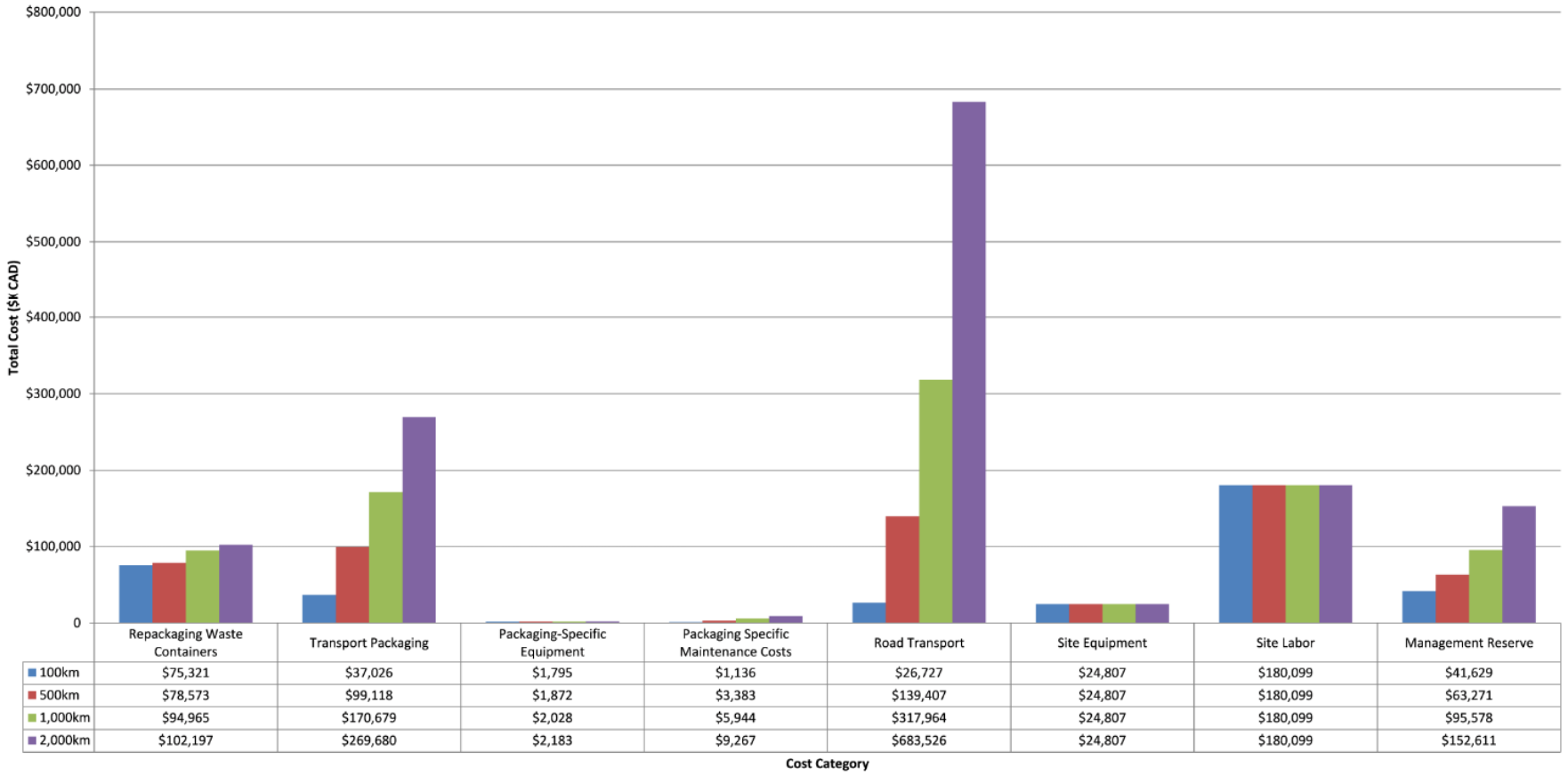
Transportation Cost Development – Major Cost Categories



	Repackaging Waste Containers	Transport Packaging	Packaging-Specific Equipment	Packaging Specific Maintenance Costs	Road Transport	Site Equipment	Site Labor	Management Reserve
100km	$75,321	$37,026	$1,795	$1,136	$26,727	$24,807	$180,099	$41,629
500km	$78,573	$99,118	$1,872	$3,383	$139,407	$24,807	$180,099	$63,271
1,000km	$94,965	$170,679	$2,028	$5,944	$317,964	$24,807	$180,099	$95,578
2,000km	$102,197	$269,680	$2,183	$9,267	$683,526	$24,807	$180,099	$152,611

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Transportation Risk Management

- OPG transports over 800 consignments of radioactive material every year
  - Over approximately 500,000 kilometres.
- OPG has been safely doing so for over 40 years and has never had an accident resulting in a radioactive release or a serious personal injury.
- Safe performance is due our Nuclear Management System:
  - Radioactive Materials Transportation Program
  - Processes and programs to ensure OPG achieves its safety objectives, continuously monitors its performance against these objectives, and fosters a healthy safety culture.

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Packaging and Transportation Incremental Risks - 1

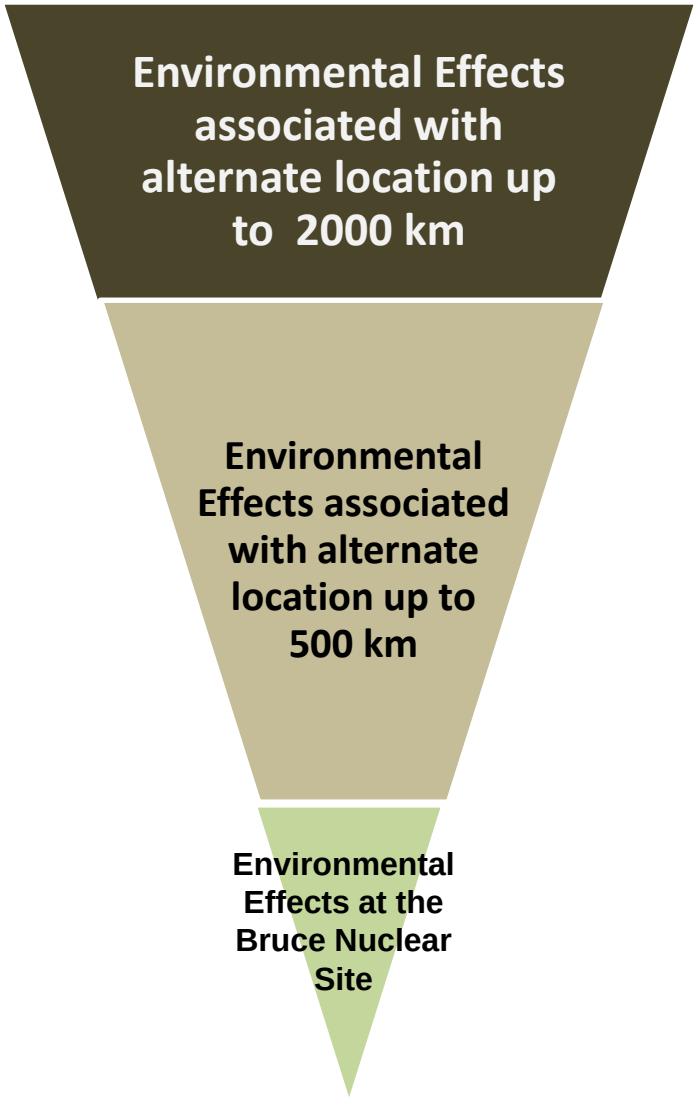
- At WWMF and Alternate Location
  - Conventional Risks:
    - Increased probability for vehicular accidents during:
      - delivery of new transportation containers to WWMF
      - Movement of heavy equipment needed to load/unload waste
      - Movement of workers and goods
  - Radiological Risks:
    - Increased dose exposure due to
      - Additional waste handling (repackaging more, more steps)
      - Additional waste processing

Packaging and Transportation Incremental Risks - 2

- During Transportation
  - Vehicle Related Risks:
    - Potential human health affects due to increased levels of vehicular emissions
    - Potential for injuries and/or fatalities
  - Cargo Related Risks
    - Exposure of low levels of ionizing radiation (during routine transportation and during accidents)
      - During routine transportation – external dose from packages
      - During transportation related accidents – release of radioactive material via multiple environmental pathways

Study of Alternate Locations
Overall Findings

Study of Alternate Locations - Findings



- More environmental effects occur at the Alternate Locations due to:
  - Installation of site infrastructure and equipment for receiving and interim storage of waste
  - Additional waste packaging and transportation
  - Additional GHG emissions during a long transportation campaign.
- Mitigation measures are expected to eliminate, minimize, or control the majority of these effects
  - No significant adverse effects are expected

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Study of Alternate Locations - Findings

- Packaging and transporting waste to an Alternate Location would result in:
  - An increase in transportation risks: 22,000 shipments on public roadways.
  - A cost impact in the range of $0.4 - $1.4B
    - longer distances have highest potential cost
    - This doesn't include additional project costs from re-starting the program
- Overall, the Bruce Nuclear site remains the preferred location

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Information Request #2

Updated Cumulative Effects Analysis

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#2 Updated Cumulative Effects Analysis: NWMO APM Process

- APM DGR for used fuel
  - Federal approved plan
  - Multi-year siting process
  - No sites have been identified
  - No community has volunteered to accept the project
  - No detailed design / safety / environmental assessment
  - NWMO has committed to working with local communities, including SON
  - Process would include identifying, assessing and mitigating effects

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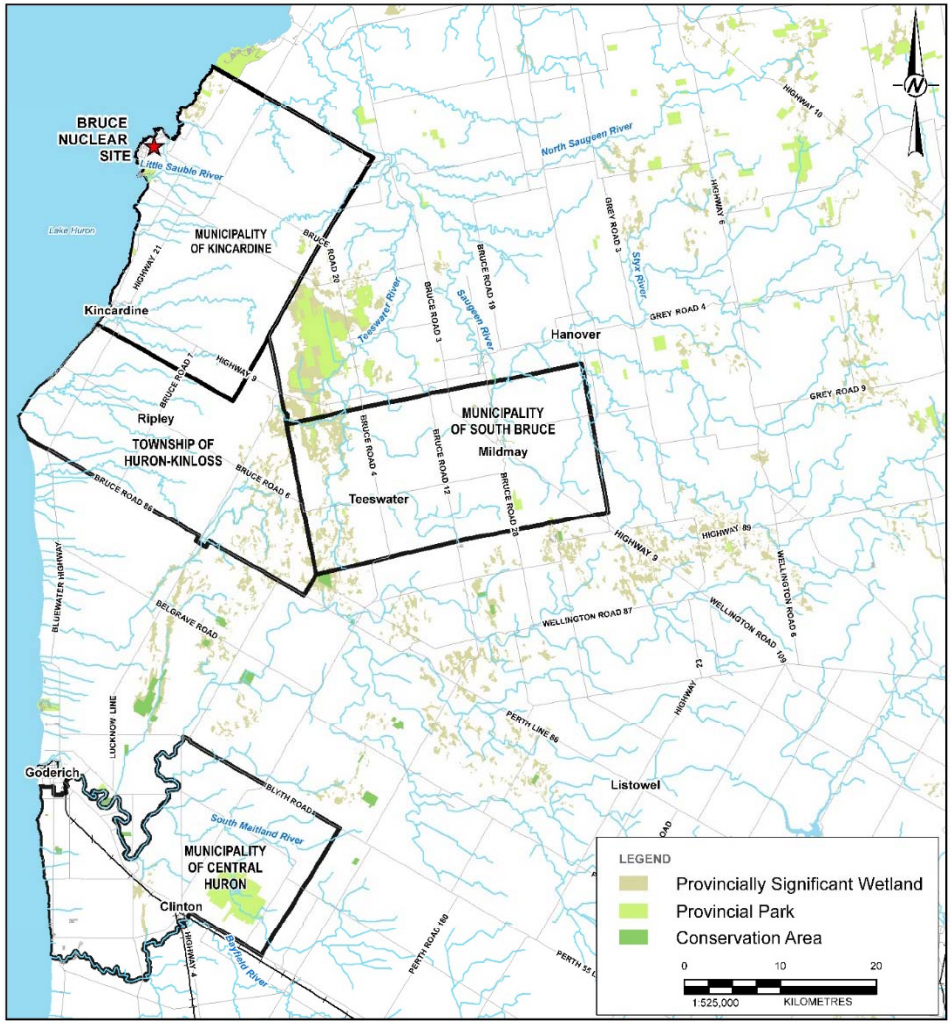
#2 Updated Cumulative Effects Analysis: Map of Municipalities



- For purpose of responding to Minister, an APM DGR is assumed located somewhere in Huron-Kinloss, South Bruce or Central Huron
- Would be at least 20 km from OPG DGR
- Project as per NWMO published descriptions and safety case studies
- Would be sited and designed to be safe; would meet all discharge criteria at APM DGR site boundaries
- Potential effects as per NWMO Phase 1 assessments

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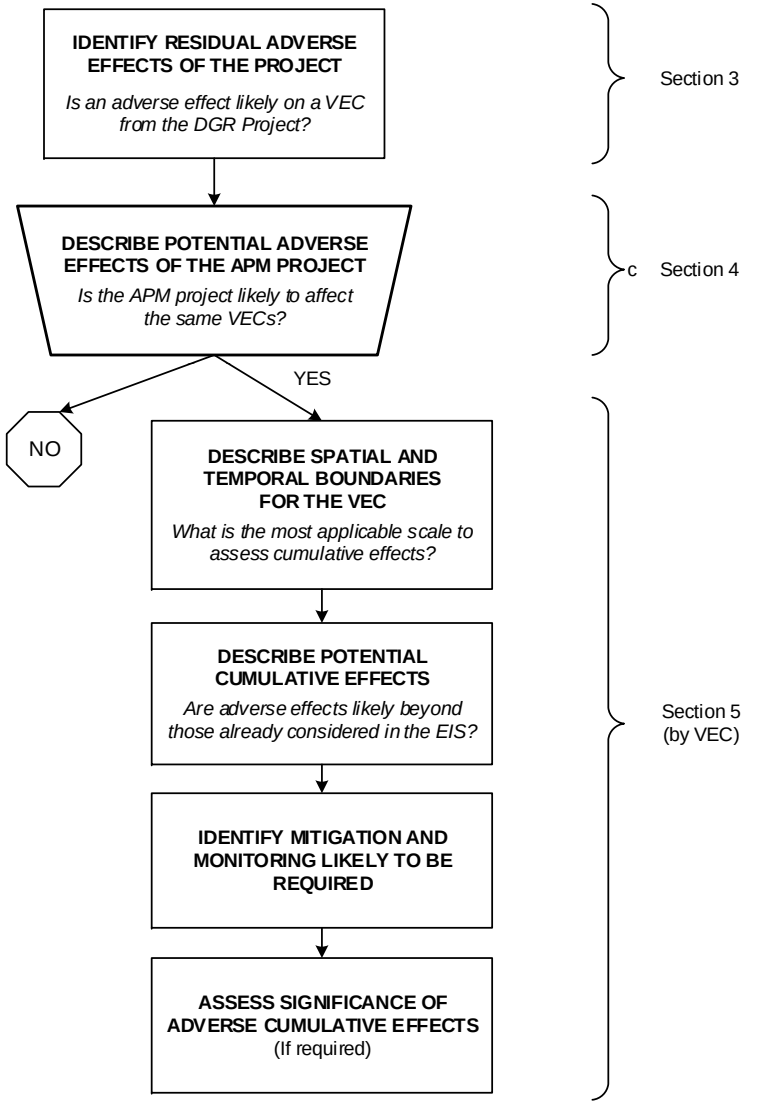
CEAA 2012 Requirements

- Cumulative environmental effects described and assessed based on consideration of an APM DGR in Huron-Kinloss, South Bruce or Central Huron
- Considered updated guidance since EIS filing:
  - Canadian Environmental Assessment Agency's Operational Policy Statement Assessing Cumulative Environmental Effects under CEAA, 2012
  - Draft Technical Guidance for Assessing Cumulative Effects under CEAA, 2012
- Includes consideration of potential cumulative effects of malfunctions and accidents

Overall Approach



- Valued component-focused narrative discussion
- Cumulative effects analysis considers whether in concert with potential effects of the APM Project these adverse effects could significantly affect valued components
- For the purposes of the assessment have assumed that potential effects are residual effects

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Residual Adverse Effects: OPG DGR Project

Environmental Component	Residual Adverse Effect
Surface water	- Reduction in flow in North Railway Ditch - Increase in flow in Interconnecting Drainage ditch
Terrestrial environment	Loss of eastern white cedar due to site clearing
Aquatic environment	Loss of aquatic habitat in ditches due to bridge construction
Air quality	Increase in some air pollutants due to industrial activity
Noise	Increase in noise levels
Socio-economic	Reduction in enjoyment of nearby property due to increased noise level
Human health	Increase in acrolein levels in air (from diesel equipment)
Radiation and radioactivity	Radiological emissions (although no residual adverse effect)

Consideration of Temporal Overlap

- The two projects overlap temporally, although their site preparation and construction phases are likely to occur at different times

	2015→	2025→	2035→	2045→	2055→	2065→	2075→	2085→	2095→	2105+++		
OPG DGR												
Site Preparation and Construction: 2018 – 2025												
Operations 2026-2066												
Monitoring 2067-2071												
Decommissioning 2072 – 2076												
Postclosure 2077 ++												
APM DGR												
Site Preparation and Construction 2032 – 2042												
Operations 2043-2083												
Extended Monitoring 2083 – 2153										≈		
Decommissioning & Closure 2153-2183											≈	
Postclosure 2183+++												≈

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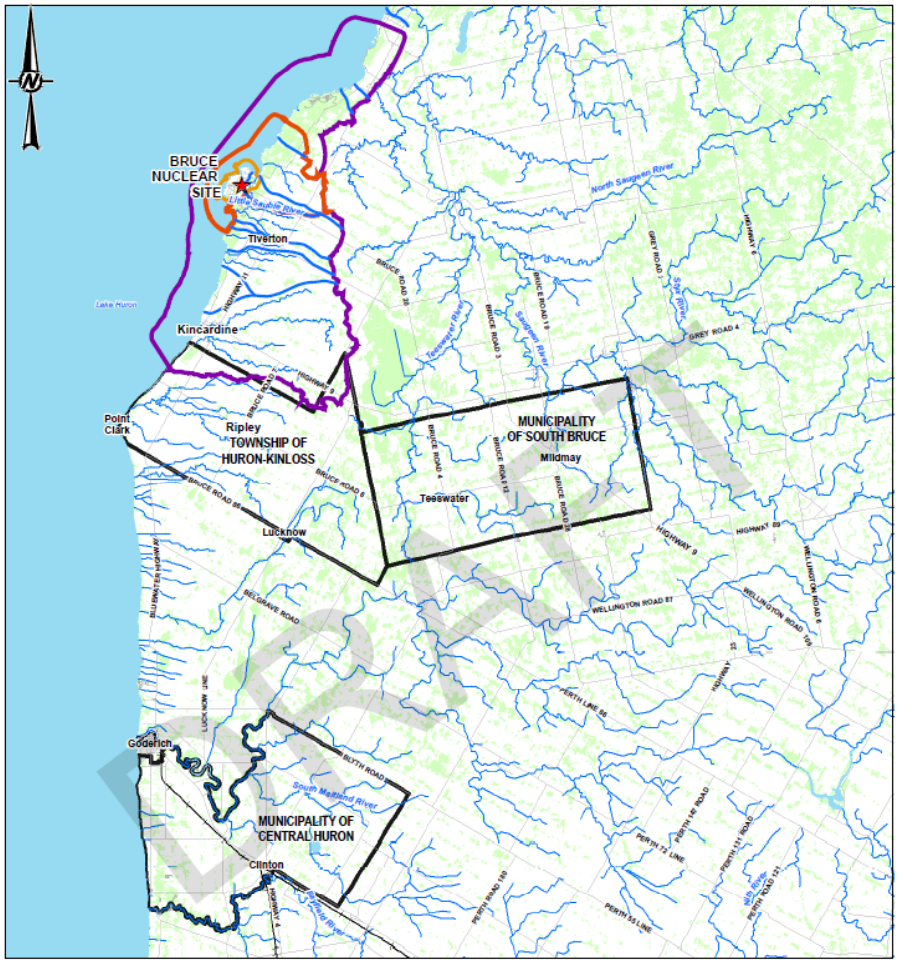
Updated Cumulative Effects Analysis: Hydrology

- Residual adverse effects of the DGR Project identified in existing engineered channels (i.e., North Railway Ditch and drainage ditch at Interconnecting Road)
- Potential effects from the APM DGR identified on surface water flow
  - Site clearing, construction dewatering, and management of surface water drainage, stormwater, and wastewater
  - These activities may contribute to a change in flow in local drainage areas in the vicinity of the selected site
- Thus, the APM DGR is likely to have both overlap in the type of effect (i.e., affect the same VC, surface water flow), and overlap in time with the residual effects of the DGR Project.

Updated Cumulative Effects Analysis: Hydrology



- Mitigation measures will be in place to limit effects
  - Compliance with applicable regulations and permitting requirements
  - Siting and design would seek to avoid or mitigate effects on surface water quantity and flow
- The APM DGR would not in any event be within the same watershed as the DGR Project
- Cumulative residual effects on surface water quantity and flow are unlikely

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Updated Cumulative Effects Analysis: Noise Levels

- Residual adverse effects identified during site preparation and construction and decommissioning phases at closest receptors (approximately 1 km from the DGR Project site)
- Potential effects from the APM DGR identified on noise levels
  - Site selection, construction, operation, and decommissioning and closure all require equipment and activities that generate noise emissions
  - For APM construction-like activities will continue through operations
  - Transport of used fuel may also generate noise (~2 trips per day)
- Both projects are therefore likely to affect the same VC

Updated Cumulative Effects Analysis: Noise Levels

- Timing of effects are unlikely to overlap
  - Construction activities for DGR Project may be complete in advance of APM Construction
- Mitigation measures included in both projects to limit the extent of effects to within 1-2 km of Project activities
  - Best management measures to ensure both projects they meet regulatory limits and guidelines (e.g., MOECC guidelines for noise or equivalent), and municipal bylaws, as applicable at receptor locations
- The APM DGR will be at least 20 km from the OPG DGR
- Cumulative effects on noise levels are unlikely as a result of the APM DGR

Updated Cumulative Effects Analysis:
Non-Radiological Malfunctions and Accidents

- EIS considered a bounding non-radiological spill
  - From a vehicle accident, failure of on-site storage equipment (i.e., a storage tank) or operational errors
- Potential effects of a spill would be contained within the DGR Project or APM DGR site
  - Measurable changes to soil and groundwater quality from a spill are possible
  - In the unlikely event a spill would reach a waterbody, it would be confined to the onsite drainage ditches, where it can be contained in advance of a release to the environment (e.g., to Lake Huron)
- Spills would be responded to quickly, and remedial actions put in place to limit effects on the environment
- No adverse cumulative effects likely

Updated Cumulative Effects Analysis: Radiological Malfunctions and Accidents

- During the postclosure phase, there were only a few scenarios where effects could approach or exceed criteria
  - For example, inadvertent drilling of a borehole into the repository horizon or a substantive failure of shaft seals
- If one of the above scenarios occurred at the OPG DGR site after several hundred years, the main potential radiological consequence would be the release of gaseous carbon-14
  - The effects of this would be of highest magnitude around the OPG DGR site, as it would rapidly disperse in the atmosphere
  - At that time in the future, the APM DGR would also be closed and sealed and it is expected that there would be no measurable additional radioactivity at surface due to the APM DGR
- Therefore, there would be no adverse cumulative effects likely

Updated Cumulative Effects Analysis: Findings

- The results of the assessment showed that cumulative adverse effects are unlikely given the distance and limited extent of the environmental effects of both projects.
- In addition a cumulative environmental effect as a result of malfunctions and accidents from both projects is also unlikely.
- As a result, no new residual adverse cumulative effects were identified, and an assessment of significance was not required.

Information Request #3
Mitigations Report

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Mitigations Report: Commitments

- OPG has tracked all commitment statements made in its 2011 submission documents and over 3 years of public review and Hearings ("OPG will …")
- Documented in the Consolidated Commitment Lists Report
- Over 900 listed in the 2014 (R2) Report
  - Most of these are repeated commitments, but made in different places and times
  - About 3/4 are associated with mitigating and monitoring environmental effects

Mitigations Report

- Mitigations Report includes:
  - Mitigation measures included in facility plans, and identified in the conduct of the EA,
  - Monitoring commitments to confirm that mitigation measures are effective and effects are as predicted,
  - Mitigation and monitoring activities identified in CEAA's proposed conditions as accepted by OPG.
- Consolidates into approximately 150 main commitments
  - Supported by about 500 detailed commitments
- Also identifies commitments that have been completed to date or have been updated

Mitigations Report

Mitigations Report: Structure

- Mitigations are grouped by related Valued Ecosystem Components

Groupings:
Geology
Hydrology and Surface Water Quality
Terrestrial Environment
Aquatic Environment
Radiation and Radioactivity
Atmospheric Environment
Aboriginal Interests
Socio-Economic Environment
Human Health
Ecological Features

Mitigations Report: Example #1

VEC: Hydrology and Surface Water Quality - Surface Water Quality

- *Main Commitment*: All stormwater runoff from the DGR Project site, including the WRMA, will be collected into drainage ditches that flow into the stormwater management pond.
- *Detailed Commitments:*
  - Site will be graded to capture all stormwater collected on site
  - Vegetated perimeter ditches will control sediment loading in the pond
  - An oil/water separator (i.e. stormceptor) will control hydrocarbon releases, Total Suspended Solids and metals associated with TSS
  - A temporary water treatment plant … will be located in the vicinity of the shafts to receive water pumped from underground in the event that there will be abnormally high concentrations of oil, grease and/or grit in the water.
  - …

Mitigations Report: Example #2

VEC: Hydrology and Surface Water Quality - Surface Water Quality

- *Main commitment:* Water sampling and testing is proposed to confirm that all water released from the DGR Project site via the stormwater management pond has concentration levels below certificate of approval discharge criteria
- *Detailed commitments:*
  - Final water quality criteria for the effluent from the pond will be developed as part of the Ontario Environmental Compliance Approval
  - OPG will, prior to construction, submit to the CNSC a plan for treatment of all water destined for discharge from the stormwater management pond
  - Samples will be collected quarterly at a minimum throughout the site preparation and construction phase as described in the EA Follow-up Monitoring Program document
  - …

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Mitigations Report: Example #3

VEC: Radiation and Radioactivity - Humans

- *Main Commitment:* Waste Package Receipt, Transfer and Handling procedures and processes will be implemented
- *Detailed Commitments:*
  - All waste packages sent to the DGR will be checked against the DGR waste acceptance criteria, which will include measuring the waste package dose rate to ensure it is within specified limits
  - OPG will prepare an inspection protocol for waste containers, beyond visual inspection, that must be followed before their placement in the DGR
  - At no time will radioactive waste be transferred in the main cage while personnel are being concurrently transferred in the auxiliary cage under normal operating conditions
  - …

Mitigations Report: Example #4

Examples of Completed Commitments:

- Shaft pilot programs, which are to be established prior to excavation and construction.
  - ✓ Completed in 2011. Pilot boreholes drilled at shaft locations.
- Grouting trials to confirm feasibility of surface-based grouting.
  - ✓ Completed in 2012
- Installation of a shallow groundwater monitoring program.
  - ✓ Completed in 2012 with additional 8 monitoring wells.
- Specification of the geoscientific verification to be done in the ventilation shaft (in addition to the main shaft)
  - ✓ Completed in 2014

Response to Minister's Request

Next Steps

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DGR Next Steps

- OPG is on track to provide the Canadian Environmental Assessment Agency the requested information in December.
  - OPG will incorporate feedback/comments from this round of public/stakeholder review
  - OPG will post the final submission information on our web site
- This new, additional information supports the current plan for OPG's DGR at the Bruce Nuclear site as a safe and cost effective long-term management solution.