Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

Neighbours of a Nuclear Plant

An Information Session for Durham Residents

Today’s Agenda

- **Nuclear 101** - Theresa McClenaghan, Canadian Environmental Law Association (CELA)
- **Emergency Preparedness** - Gail Cockburn, Durham Nuclear Awareness (DNA)
- **Nuclear Waste and Transportation** - Brennain Lloyd, NorthWatch
- **Citizen Science & Radiation Data Collection** - Louis Bertrand, SafeCast
- **Opportunities to Engage** (influence decision-making, what you can do)
- **Questions**

Nuclear Oversight

Risks

- Even very well managed nuclear plants can have unexpected accidents
- If the accident is very severe, radioactive materials could be released, which pose a hazard to human health and the environment
- Managing the response to a large nuclear accident appropriately is critical to reduce harm and save lives
- Accidents can occur as a result of severe natural disaster, extended loss of power to the plant, aviation or rail accidents, malfeasance, components breaking, or human error
- The issues are compounded in a high population area

Energy Alternatives

- Conservation including energy retrofits and reduced demand, efficiency, net zero standards etc.
- Renewable power including solar, wind, geothermal, heat exchange are all feasible for Ontario on a large scale, along with energy storage and distribution systems
- Generation or energy services close to place of use is best

DURHAM NUCLEAR AWARENESS

Emergency Preparedness

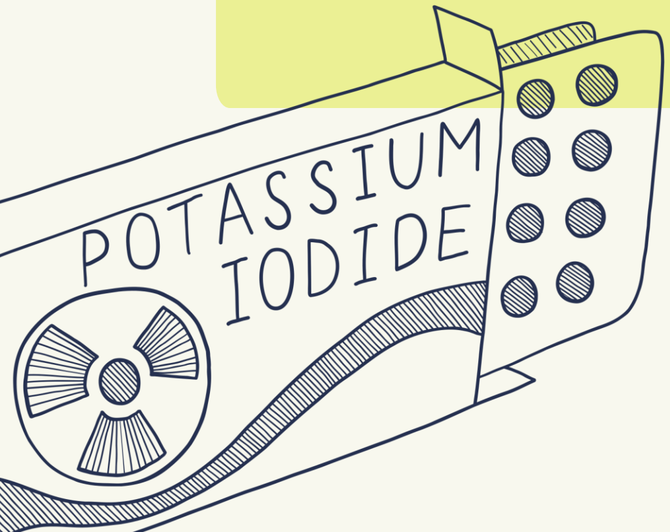


Figure 1 - Darlington Detailed Planning and Contingency Planning Zones Map

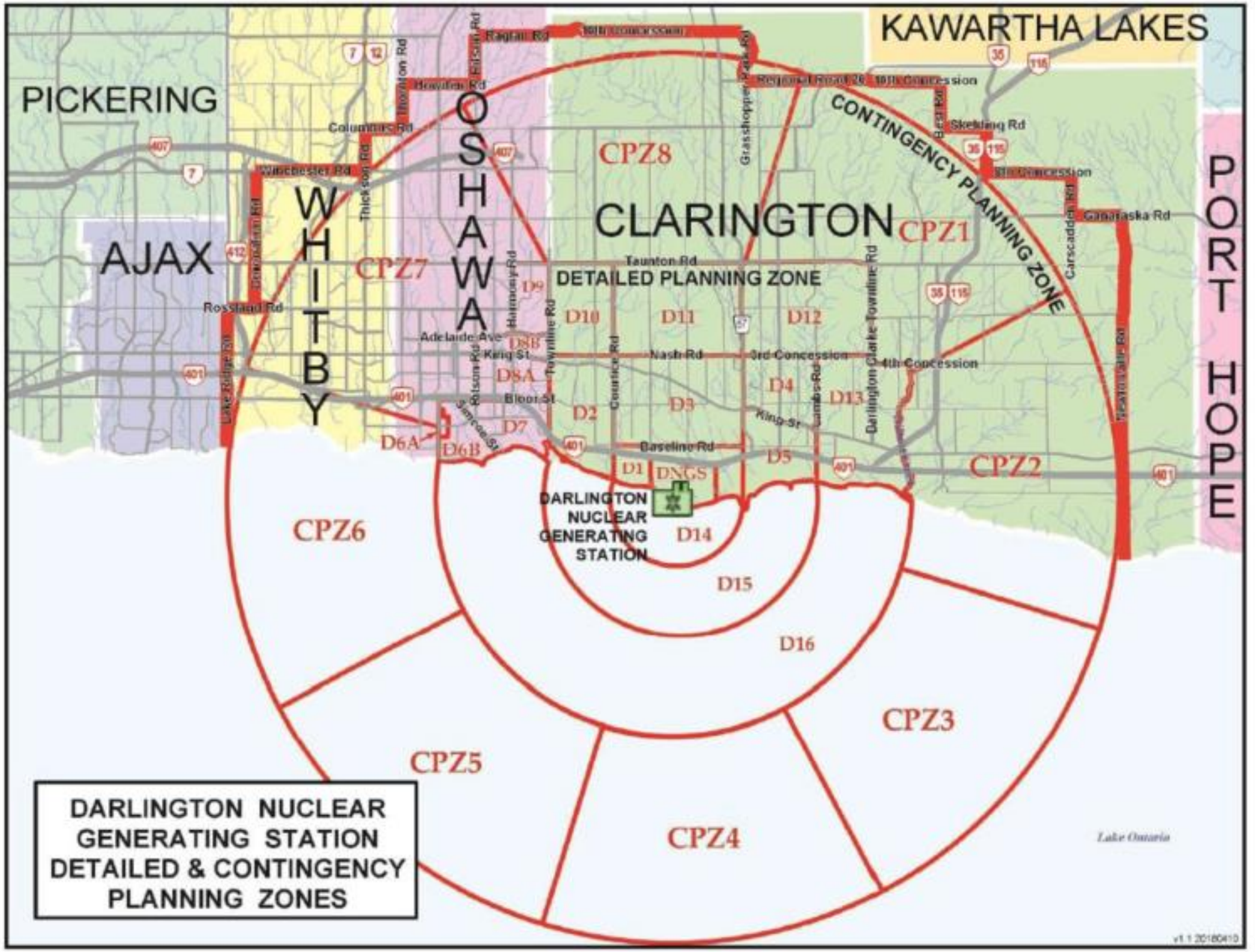


Figure 2 - Darlington Ingestion Planning Zone Map

Figure 3 - Pickering Detailed and Contingency Planning Zones Map

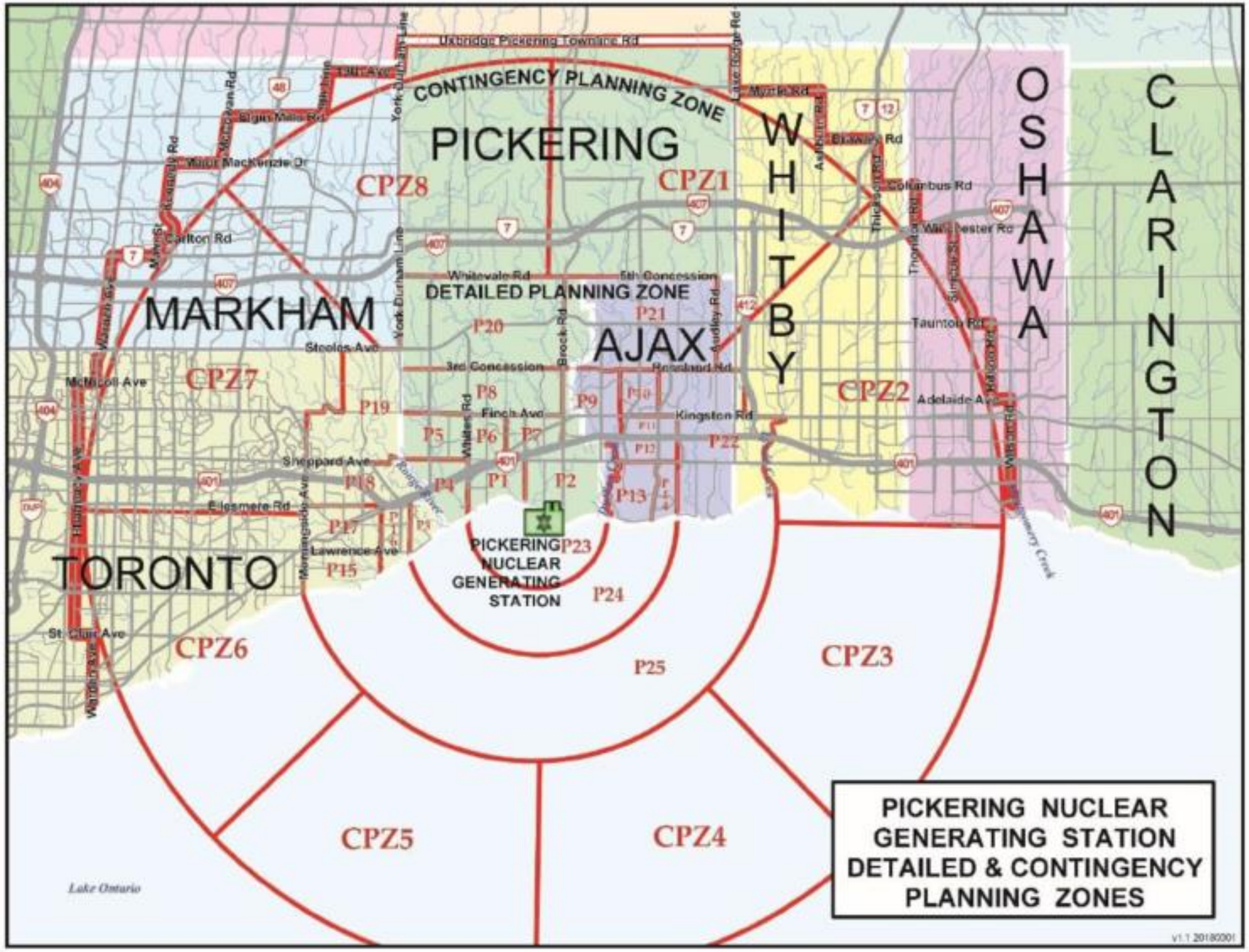
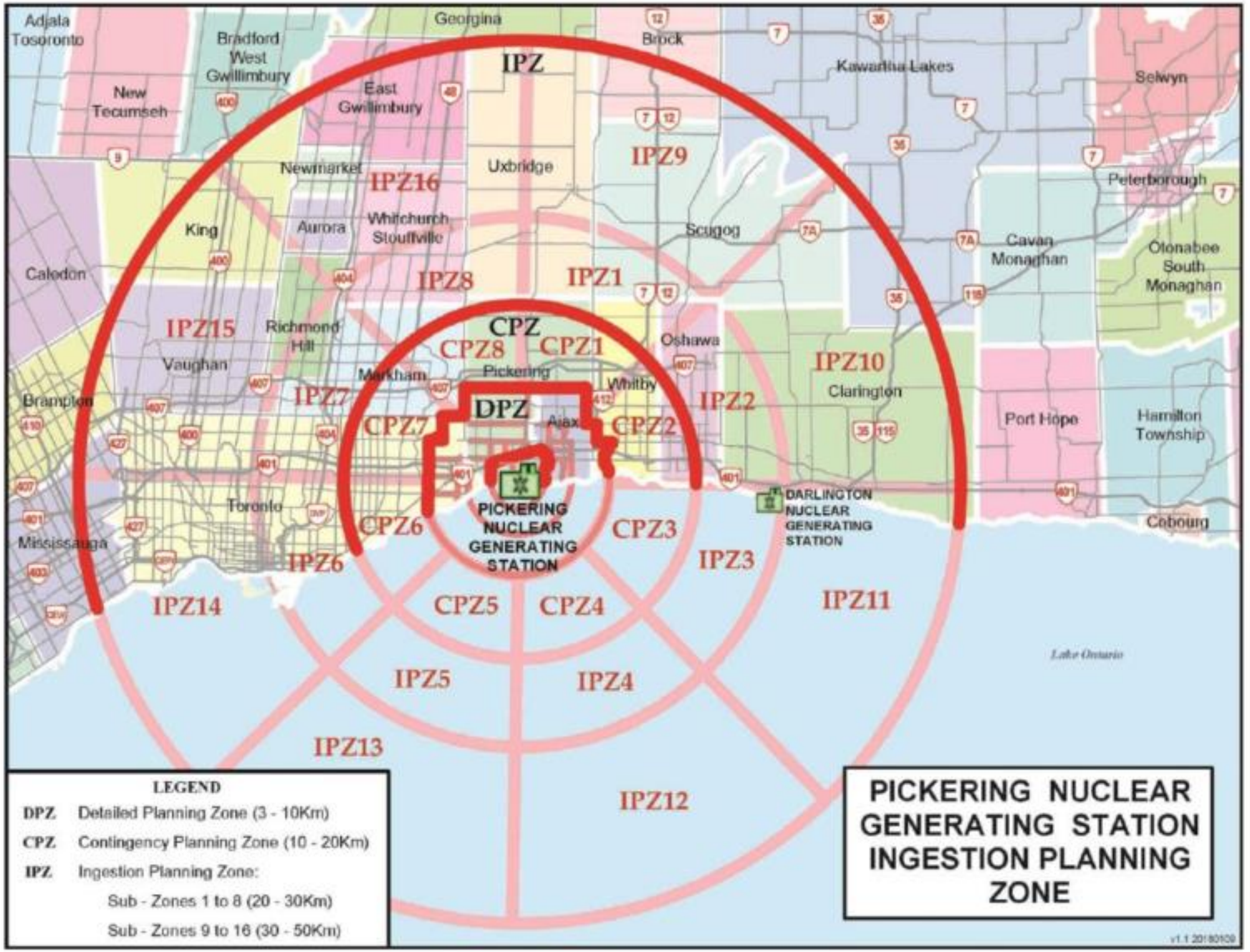


Figure 4 - Pickering Ingestion Planning Zone Map



PLANNING ZONES

Automatic Action Zone (AAZ) (3km)

- Area immediately surrounding a reactor facility
- Pre-planned actions would be taken by default

Detailed Planning Zone (DPZ) (10km)

- Pre-designated area surrounding a reactor facility
- Pre-planned actions are implemented as needed

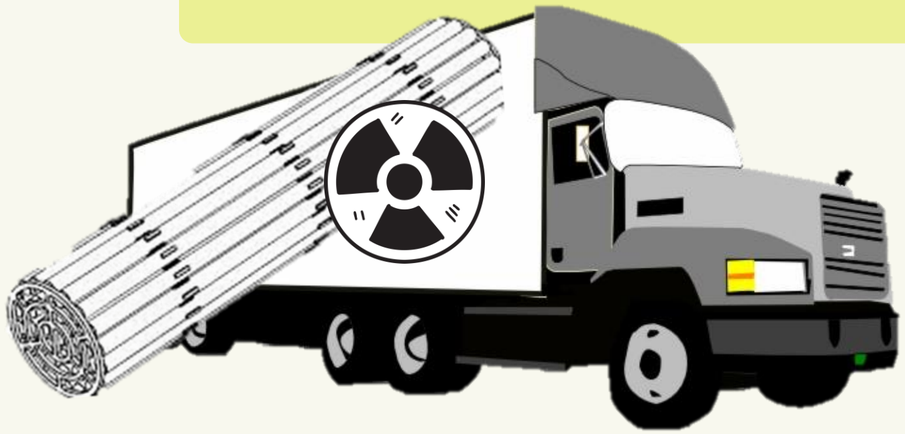
Contingency Planning Zone (CPZ) (20km)

- Predetermined area surrounding area beyond the automatic action zone where contingency plans are made

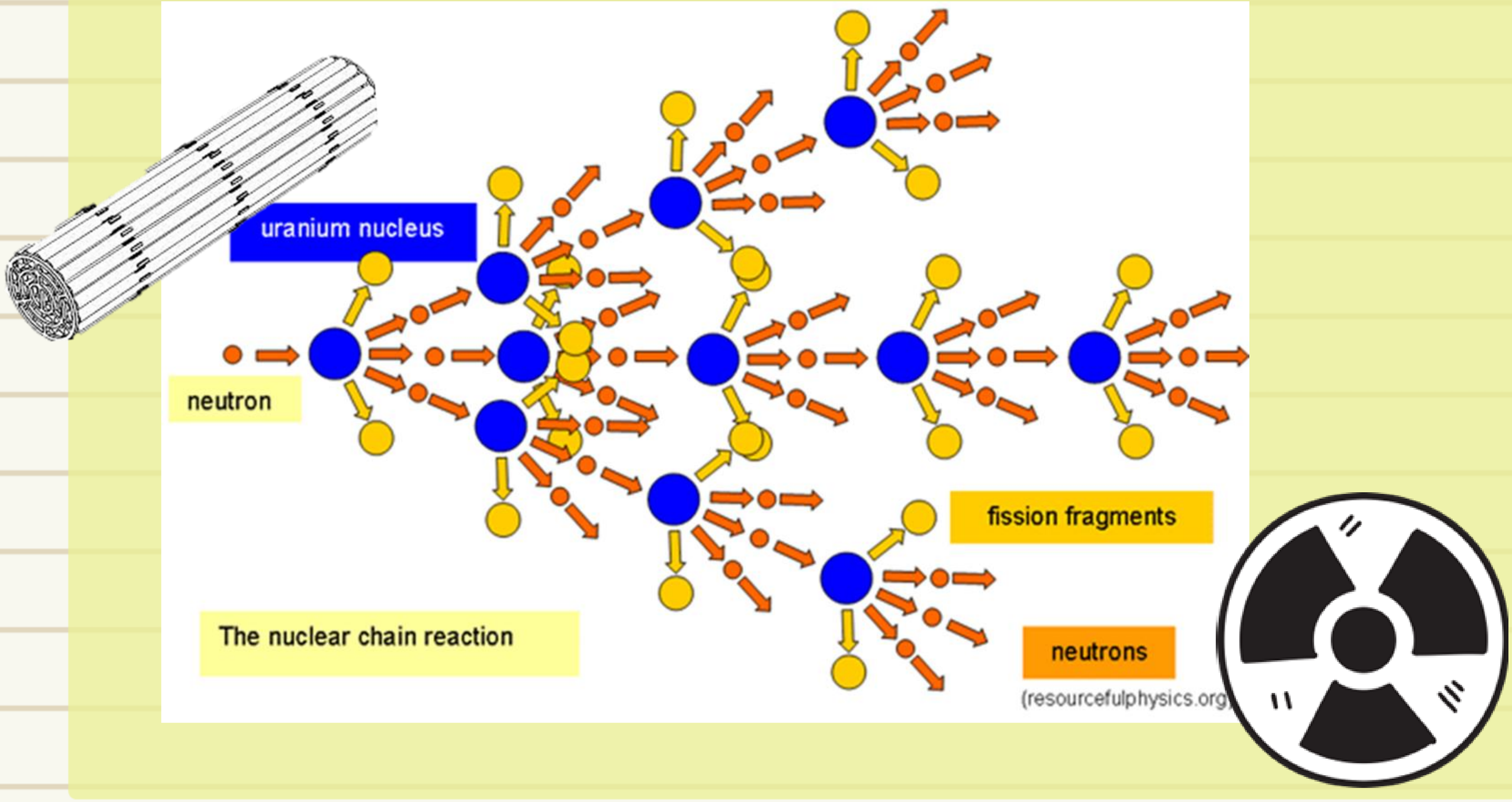
Ingestion Planning Zone (IPZ) (50km)

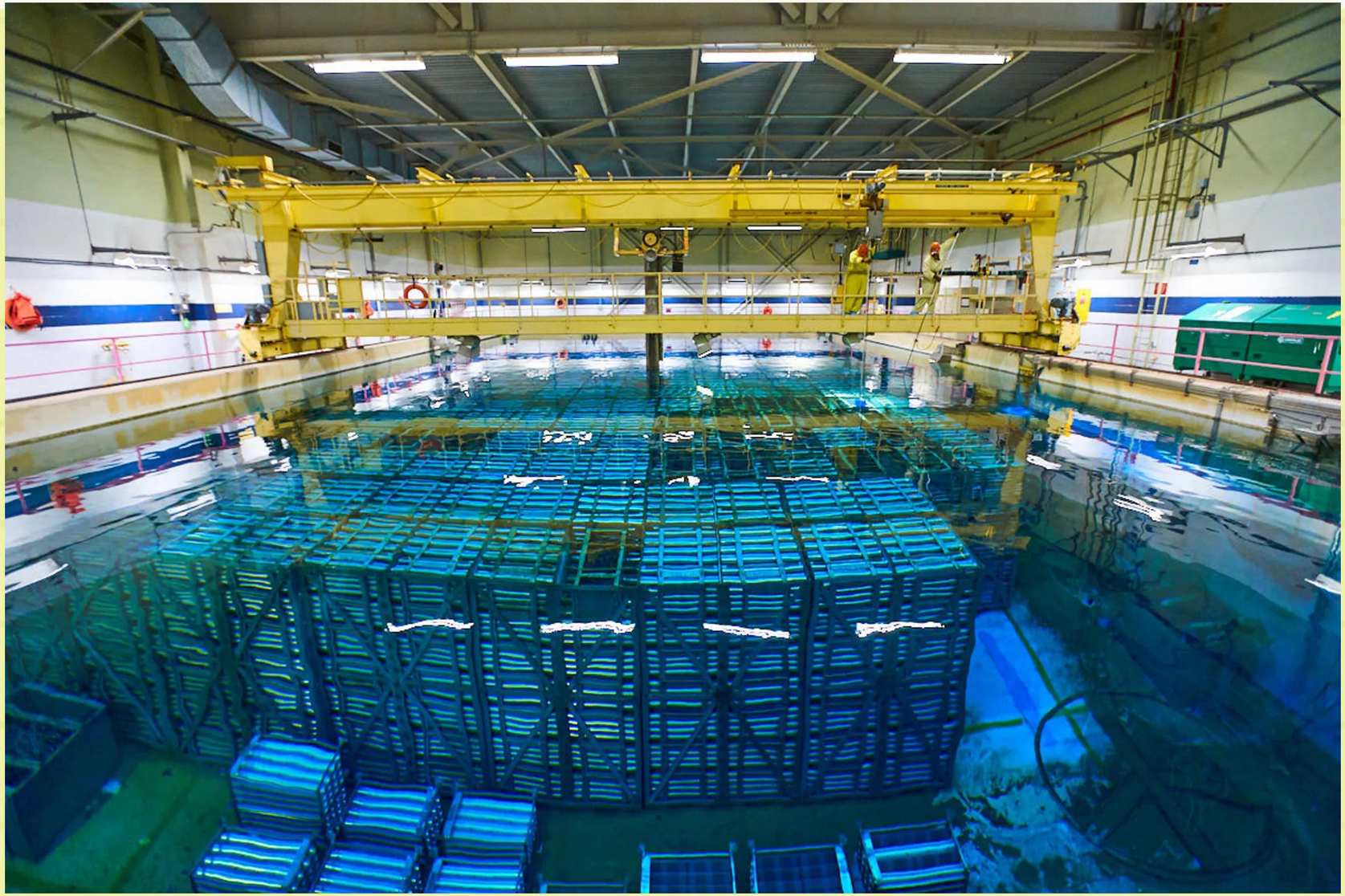
- Predetermined area surrounding a reactor where arrangements are made for protecting: food chain, water supply
- Restrict consumption and distribution of potentially contaminated produce
- Restrict distribution of non-food commodities until further assessments are performed

Nuclear Waste and Transportation



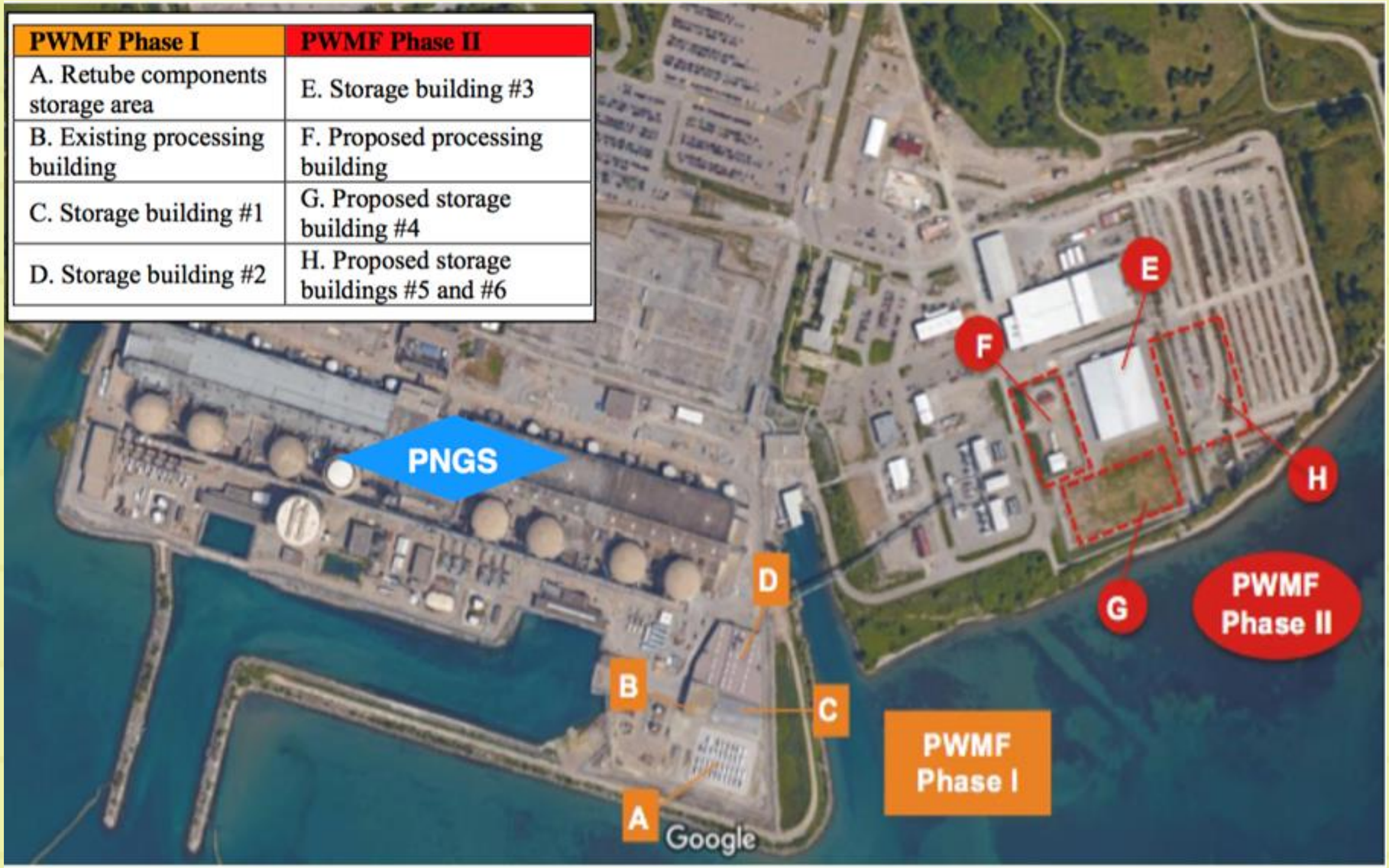
The nuclear power industry in Canada has produced 3 million bundles of nuclear fuel waste to date, weighing over 60,000 tonnes. They expect to double this volume over the next 30 years.


uranium nucleus
neutron
fission fragments
neutrons
The nuclear chain reaction
(resourcefulphysics.org)



Irradiated fuel bay – Pickering Nuclear Generating Station

Dry storage containers – Darlington



Ontario Power Generation is planning to build additional storage buildings for highly radioactive nuclear fuel waste on the shore of Lake Ontario at the Pickering Nuclear Generating Station.

Figure 2: Nuclear Sustainability Services - Darlington

Figure 1: Darlington Site

Note: The blue dotted line in this figure is the DNGS exclusion zone.

Ontario Power Generation is planning to build additional storage buildings for highly radioactive nuclear fuel waste on the shore of Lake Ontario at the Darlington Nuclear Generating Station.

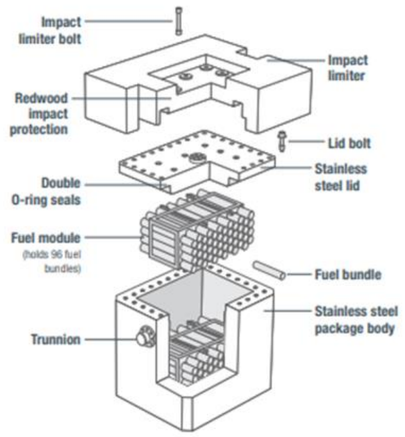
Source: “Licence Application for the Renewal of the Darlington Waste Management Facility Operating Licence WFOL-W4-355.01/2023” CD# 00044-CORR-00531-01153

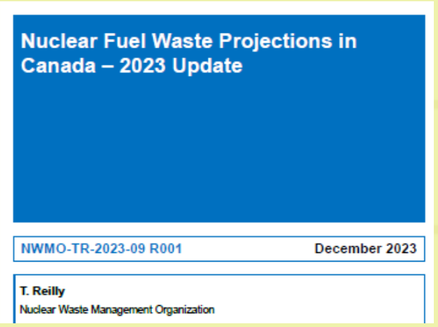
Nuclear fuel waste at Darlington and Pickering NGS

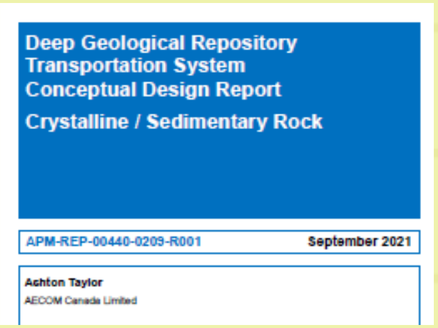
Location	Owner	Wet Storage (# bundles)	Dry Storage (# bundles)	Current TOTAL (# bundles	Projected total (# of bundles)
Darlington	OPG	301,232	338,981	640,213	1,283,000
Pickering	OPG	376,162	469,327	845,489	935,000 - 1,370,000

Used Fuel Transportation Package

The Used Fuel Transportation Package (UFTP) consists of three main components: the body, lid and impact limiter. The body and lid are made of solid stainless steel with walls nearly 30 centimetres thick. The lid is attached to the body by 32 bolts. The impact limiter consists of a redwood core encased in a stainless steel skin. The stainless steel body and lid provide containment, shielding and impact resistance. The impact limiter is designed to protect the body and lid closure in the event of an accident. The reusable package can carry 192 used fuel bundles (two modules) and weighs almost 35 tonnes when loaded.







Location	Package	Projected Volume	Projected Shipments	Start Year	End Year
Darlington	UFTP	1,268,801	6,610	2050	2088
Pickering	UFTP	902,148	4,699	2043	2050

Since 1977, the nuclear industry has been developing plans to bury the high-level radioactive waste they have created.

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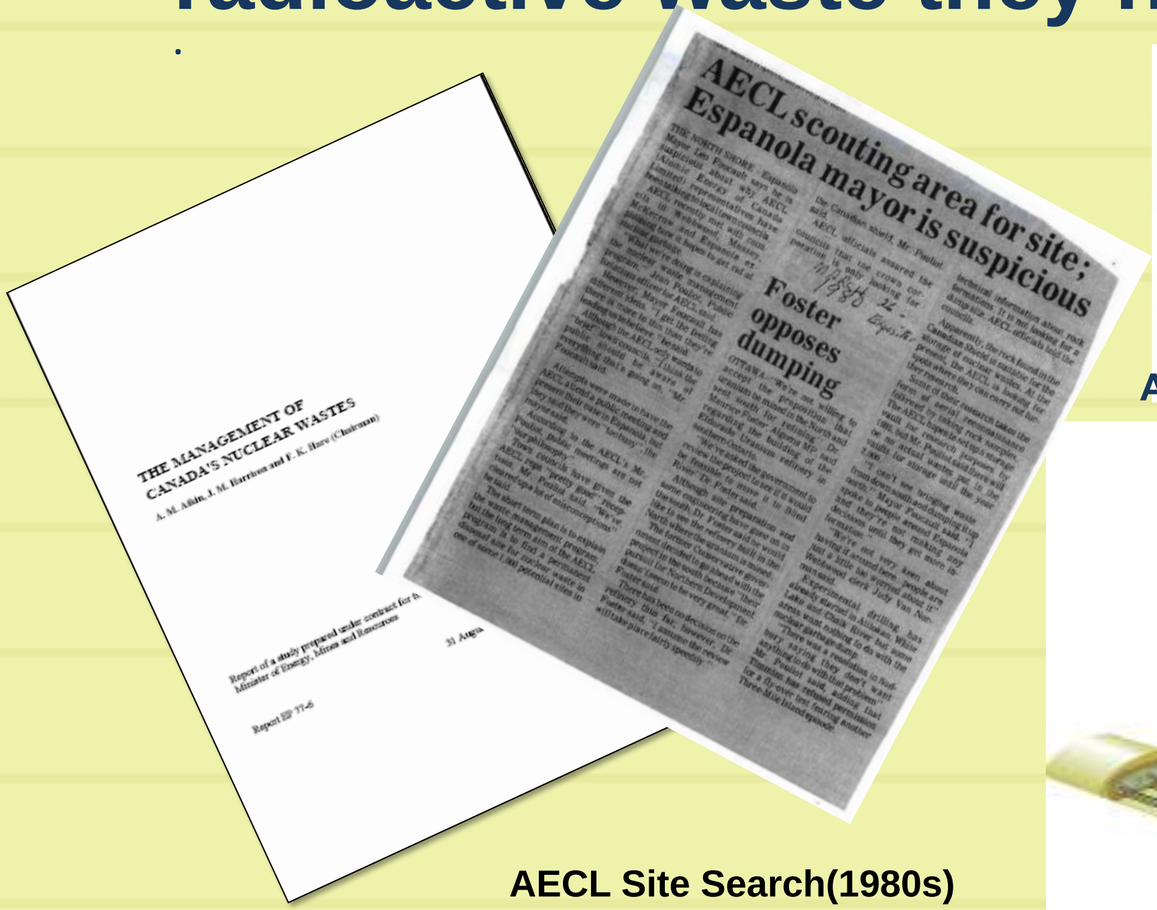
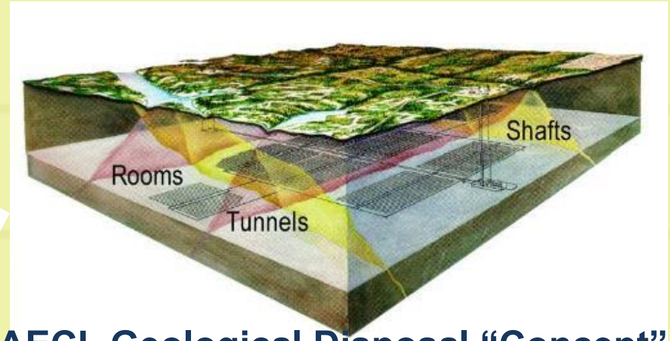
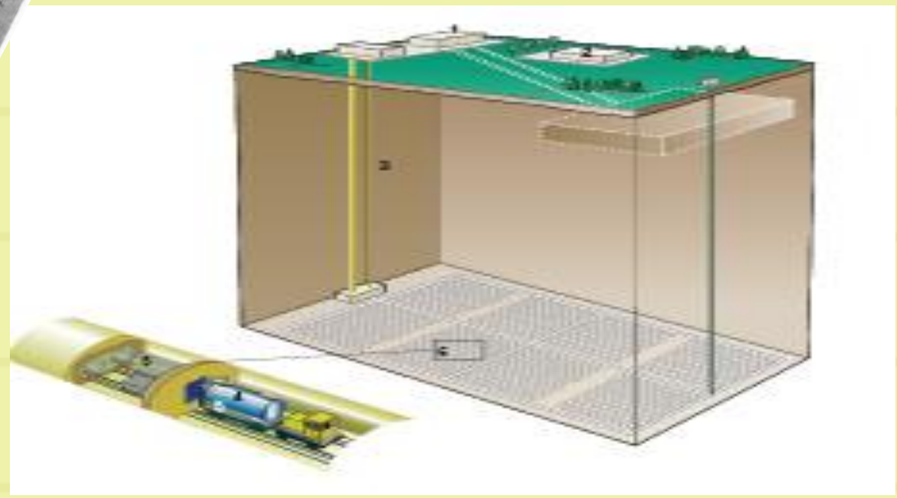


Hare Report (1970s)

AECL Site Search(1980s)



AECL Geological Disposal “Concept” (1990’s)



NWMO’s “Adaptive Phased Management” 2005

NWMO's "adaptive phased management" plan has four operating stages:

PRE-OPERATIONS STAGE: NWMO'S NINE-STEP SITING PROCESS, REG. APPROVALS

EXTRACTION: Transferring the radioactive wastes into the transportation containers at the reactor station

TRANSPORTATION: Transferring the radioactive wastes from the reactor stations to centralized location

PROCESSING: Transferring the wastes from the transportation container to the used fuel container in the 'used fuel packaging plant"

EMPLACEMENT: Transferring the wastes into the underground chambers

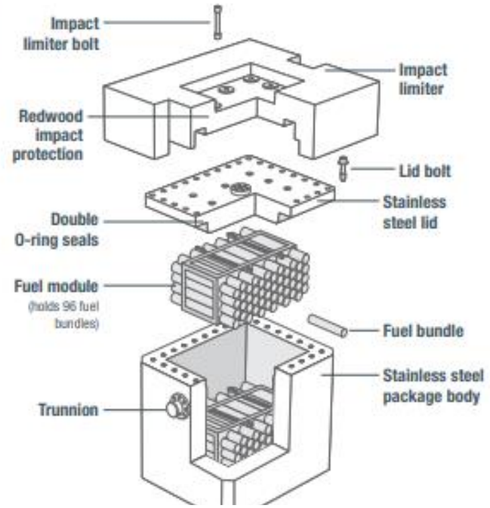
POST-OPERATIONS STAGE: ABANDONMENT

EXTRACTION: Transferring the radioactive wastes into the transportation containers at the reactor station

Figure 2.2: DSCs in a Storage Facility

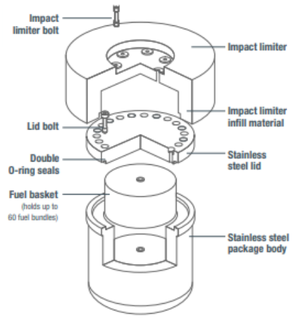
Used Fuel Transportation Package

The Used Fuel Transportation Package (UFTP) consists of three main components: the body, lid and impact limiter. The body and lid are made of solid stainless steel with walls nearly 30 centimetres thick. The lid is attached to the body by 32 bolts. The impact limiter consists of a redwood core encased in a stainless steel skin. The stainless steel body and lid provide containment, shielding and impact resistance. The impact limiter is designed to protect the body and lid closure in the event of an accident. The reusable package can carry 192 used fuel bundles (two modules) and weighs almost 35 tonnes when loaded.



Basket Transportation Package

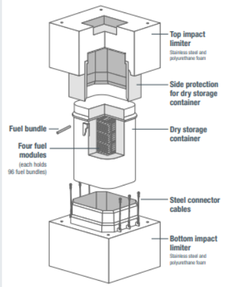
The Basket Transportation Package (BTP) is under development and designed to move used fuel that is currently stored in dry storage baskets. The BTP consists of the following main components: body, lid, and one or two impact limiter(s). The image on the right shows the BTP concept with one impact limiter. Impact limiters are designed to protect the BTP in the event of an accident. This reusable package can carry up to 120 used fuel bundles (two baskets) and is anticipated to weigh 28 tonnes when loaded.



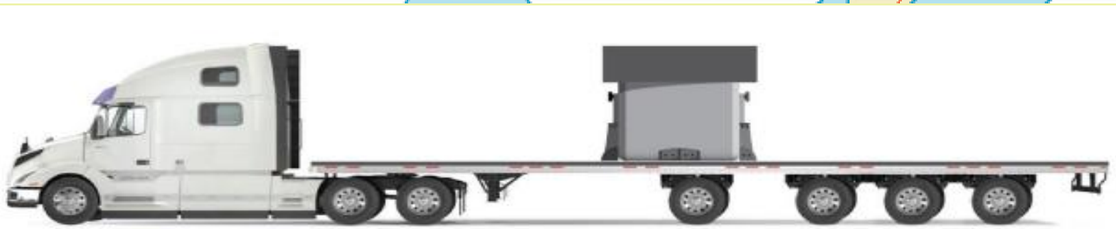
Dry Storage Container Transportation Package

Used nuclear fuel is currently stored on an interim basis in dry storage containers (DSC) at OPG Waste Management Facilities. The Dry Storage Container Transportation Package (DSC-TP) consists of a DSC fitted with impact limiters on each end.

The DSC consists of a body and lid made of high-density concrete encased in a carbon steel skin. The DSC body and lid are welded closed after being filled with used fuel. The reusable impact limiters consist of stainless steel shells filled with rigid polyurethane foam. The impact limiters are fastened together using steel cables. The DSC provides containment and shielding, and the impact limiters are designed to protect the DSC in the event of an accident. The DSC can carry 384 used fuel bundles (four modules) and weighs approximately 100 tonnes when loaded.



TRANSPORTATION: Transferring the radioactive wastes from the reactor stations to centralized location



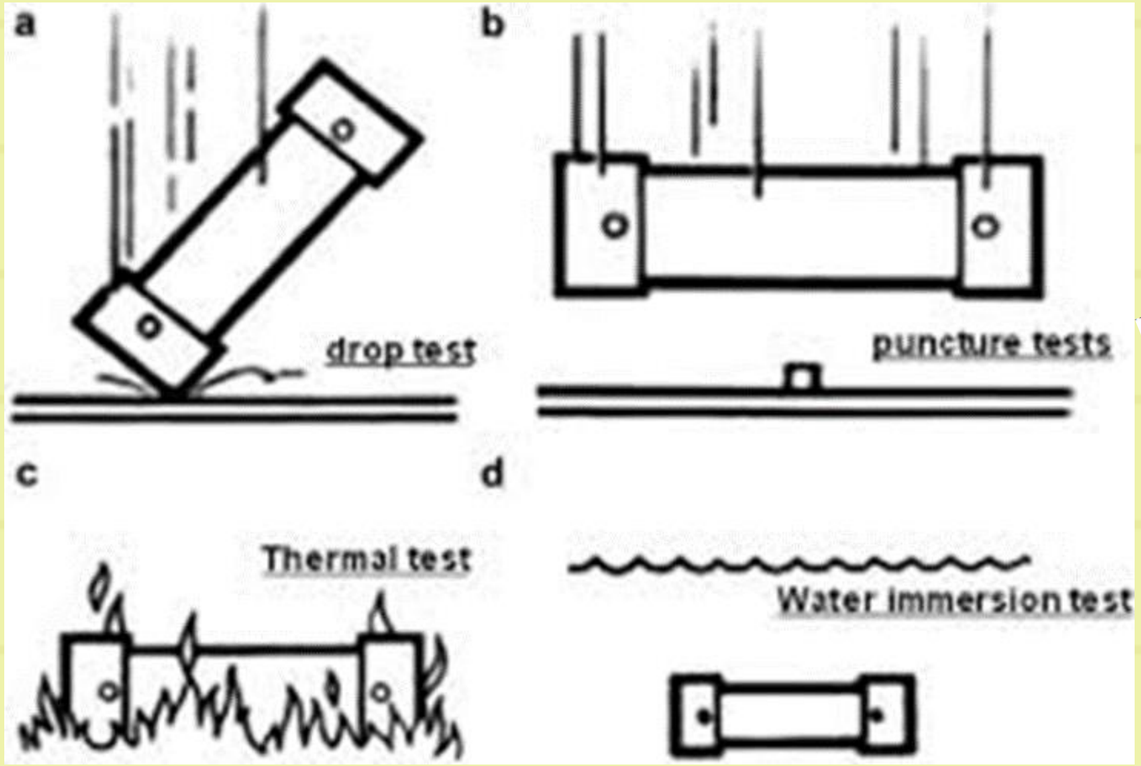
Transportation of nuclear waste in Durham region

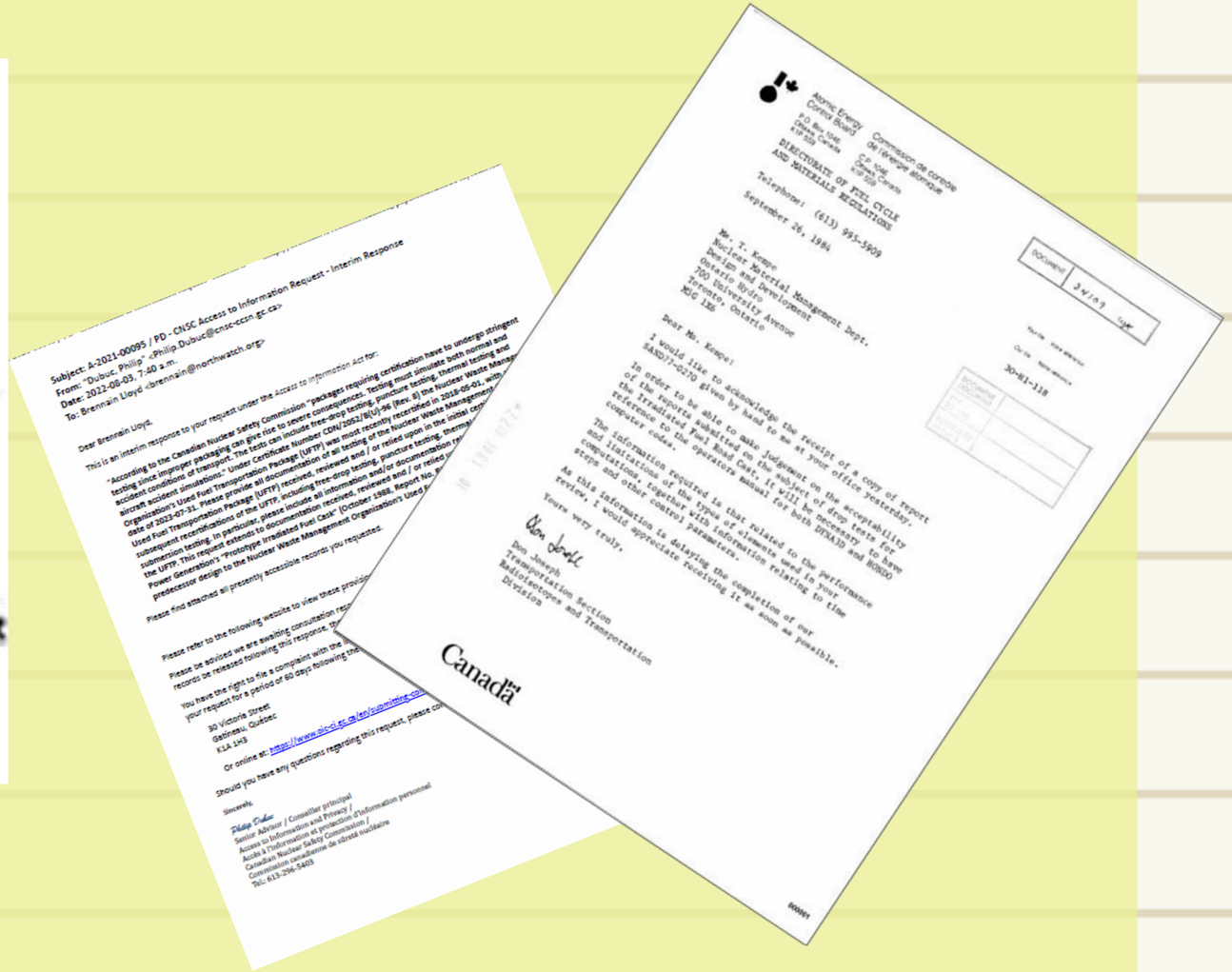
15% of highway accidents between Brock Road and Highway 400 involved a transport truck between 2019 and 2021.

There were 3,450 collisions involving transports between 2015 and 2020.

HIGHWAY COLLISIONS – PICKERING TO IGNACE 2015-2020					New MTO Data:
Location Description	Truck Collisions	All Collisions	% Truck Collisions		% Truck Collisions 2019-2021
A. Hwy 401 from Brock Rd. Pickering TO Hwy 400 North York	3,450	25,337	13.6%		15.5%

Testing Used Fuel Transportation Packages




Subject: A-2021-00095 / PD - CNSC Access to Information Request - Interim Response
From: "Dubuc, Philip" <Philip.Dubuc@cnsc-ccsn.gc.ca>
Date: 2022-08-03, 7:40 a.m.
To: Brennain Lloyd <brennain@northwatch.org>

Dear Brennain Lloyd,

This is an interim response to your request under the Access to Information Act for:

"According to the Canadian Nuclear Safety Commission "packages requiring certification have to undergo stringent testing since improper packaging can give rise to severe consequences. Testing must simulate both normal and accident conditions of transport. The tests can include free-drop testing, puncture testing, thermal testing and aircraft accident simulations." - Under Certificate Number CDN/2052/B(U)-96 [Rev. 6] the Nuclear Waste Management Organization's Used Fuel Transportation Package (UFTP) was most recently [Rev. 6] the Nuclear Waste Management Organization's Used Fuel Transportation Package (UFTP) received all documentation of all testing of the recertified in 2018-05-01, with a date of 2023-07-31. Please provide all documentation of all testing of the recertified in 2018-05-01, with subsequent recertifications of the UFTP, including free-drop testing, puncture testing, thermal testing and Used Fuel Transportation Package (UFTP) received, reviewed and / or relied upon in the initial certification of the UFTP, including free-drop testing, puncture testing, thermal testing and subsequent testing. In particular, please include all documentation received, reviewed and / or relied upon in the initial certification of the UFTP. This request extends to documentation received, reviewed and / or relied upon in the initial certification of the Nuclear Waste Management Organization's "Prototype Irradiated Fuel Cask" (October 1988, Report No. [illegible]) and Power Generation's "Prototype Irradiated Fuel Cask" (October 1988, Report No. [illegible]) and its predecessor design to the Nuclear Waste Management Organization's Used F[illegible]

Please find attached all presently accessible records you requested.

Please refer to the following website to view these provi[illegible]

Please be advised we are awaiting consultation re[illegible] records be released following this response. Sh[illegible]

You have the right to file a complaint with the I[illegible] your request for a period of 60 days following thi[illegible]

30 Victoria Street
Gatineau, Québec
K1A 1A3

Or online at: http://www.elicc-ciic.gc.ca/en/submitting-co[illegible]

Should you have any questions regarding this request, please co[illegible]

Sincerely,

Philip Dubuc
Senior Adviser / Conseiller principal
Access to Information and Privacy /
Accès à l'information et protection d'information personnel
Canadian Nuclear Safety Commission /
Commission canadienne de sûreté nucléaire
Tél.: 613-296-5403

Atomic Energy Control Board
P.O. Box 1046, Ottawa, Canada K1P 5S9

Commission de contrôle de l'énergie atomique
C.P. 1046, succursale B, Ottawa, Canada K1P 5S9

DIRECTORATE OF FUEL CYCLE AND MATERIALS REGULATIONS

Telephone: (613) 995-5909

September 26, 1984

Mr. T. Kemeny
Nuclear Material Management Dept.
Ontario Hydro
700 University Avenue
Toronto, Ontario
M5G 1X6

DOCUMENT 34/03 CNSC

Dear Mr. Kemeny:

I would like to acknowledge the receipt of a copy of report 8AN07-00270 given by hand to me at your office yesterday.

In order to be able to make judgment on the acceptability of the reports submitted on the subject of drop tests for the Irradiated Fuel Road Cask, it will be necessary to have reference to the operators manual for both IFNAID and BOR00 computer codes.

The information required is that related to the performance and limitations of the types of elements used in your computations together with information relating to time steps and other control parameters.

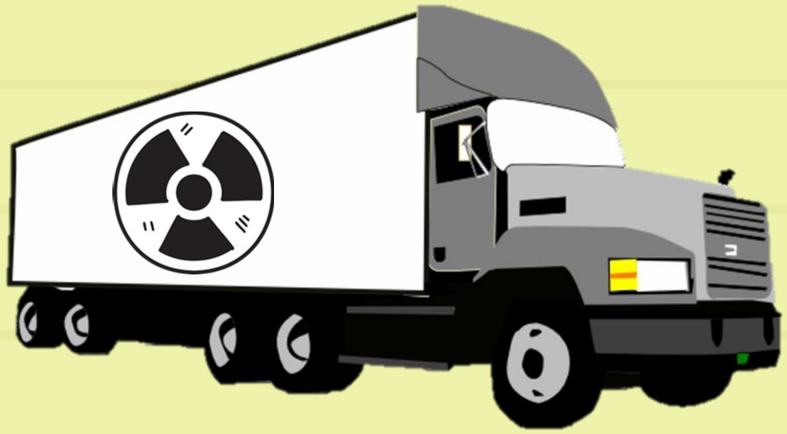
As this information is delaying the completion of our review, I would appreciate receiving it as soon as possible.

Yours very truly,

Don Joseph
Transportation Section
Radioisotopes and Transportation Division

Canada

Radiation Exposure During Transportation of Nuclear Fuel Waste



Increased level of radiation exposure due to the transportation of nuclear fuel waste can be generally grouped into three categories:

- routine transportation operations;
- accidents including severe accidents during transportation or transfer; and
- terrorist attack during transportation

First Responders and Radiological Emergencies

A Northwatch investigation during 2017 and 2018 of the information needs of small municipalities, volunteer fire fighters and First Responders around emergency response / right to know issues in the case of accidents and unintended releases the transportation of radioactive materials observed the following:

- there is no training provided specific to radiological events, with the exception of several pages in the Emergency Reference Guide
- Available trainings and training materials generally provided minimal attention to radiological risk area.
- Each of the six sections begins with the statement “Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.”

“Emergency Reference Guide 2018”, as found at https://www.tc.gc.ca/media/documents/tdg-eng/EnglishERGPDF.pdf

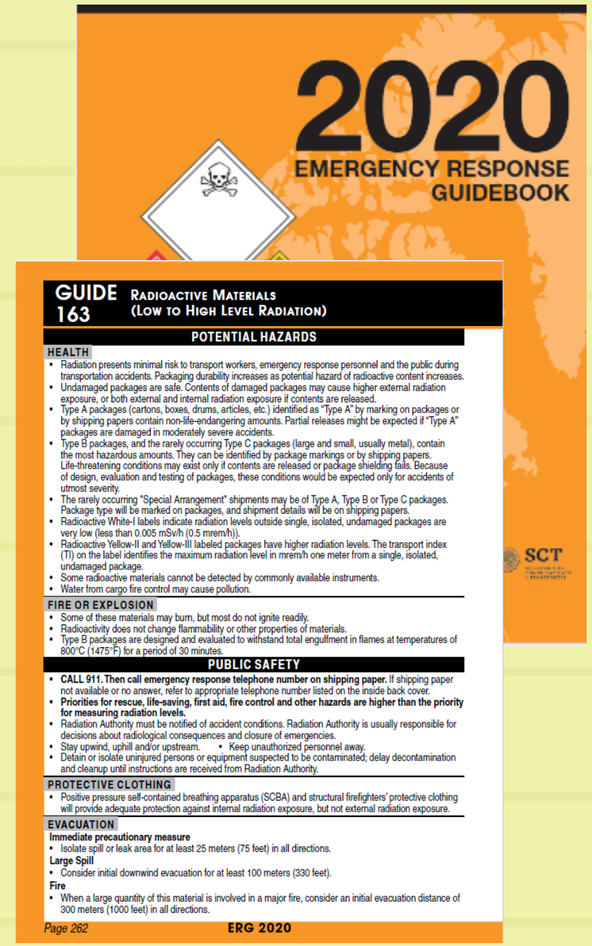
2020 Emergency Response Guidebook Dismisses Radiological Risk

GUIDE 163 Radioactive Materials (Low to High Level Radiation)

POTENTIAL HAZARDS

HEALTH

- Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents. Packaging durability increases as potential hazard of radioactive content increases.
- Undamaged packages are safe. Contents of damaged packages may cause higher external radiation exposure, or both external and internal radiation exposure if contents are released.
- Type A packages (cartons, boxes, drums, articles, etc.) identified as “Type A” by marking on packages or by shipping papers contain non-life-endangering amounts. Partial releases might be expected if “Type A” packages are damaged in moderately severe accidents.
- Type B packages, and the rarely occurring Type C packages (large and small, usually metal), contain the most hazardous amounts. They can be identified by package markings or by shipping papers. Life-threatening conditions may exist only if contents are released or package shielding fails. Because of design, evaluation and testing of packages, these conditions would be expected only for accidents of utmost severity.
- The rarely occurring "Special Arrangement" shipments may be of Type A, Type B or Type C packages. Package type will be marked on packages, and shipment details will be on shipping papers.
- Radioactive White-I labels indicate radiation levels outside single, isolated, undamaged packages are very low (less than 0.005 mSv/h (0.5 mrem/h)).
- Radioactive Yellow-II and Yellow-III labeled packages have higher radiation levels. The transport index (TI) on the label identifies the maximum radiation level in mrem/h one meter from a single, isolated, undamaged package.
- Some radioactive materials cannot be detected by commonly available instruments.
- Water from cargo fire control may cause pollution.



“Radiation presents minimal risk to transport workers, emergency response personnel and the public during transportation accidents.”

Radioactive Waste Transportation & Accident Risk

"High-level radioactive waste has been transported safely nationally and internationally for over 45 years by road, rail, water and air, without a single radiological incident."

Canadian Nuclear Safety Commission

http://nuclearsafety.gc.ca/eng/waste/high-level-waste/index.cfm as posted 1 October 2022

The following are road transportation accidents that took place in Canada between 2016 and 2018 and were publicly disclosed by the Canadian Nuclear Safety Commission:

- January 2018, accident between Wawa and Sault Ste. Marie,
- May 2017, two separate transport incidents involving low-level radioactive loads from Bruce Nuclear NGS
- December 2016, transport accident west of North Bay
- April 2016, accident on Highway 17 near Massey
- January 2016, accident and container was breach, spill of uranium

Two additional incidents had their origin in Canada, but occurred in the U.S.:

- In 2013, a truck hauling uranium hexafluoride caught fire near Troy, Ohio.
- In 2017, one of the first shipments of high-level liquid radioactive waste from Chalk River in Canada to Savannah River Site (SRS) in South Carolina was found to be “hot” upon arrival at SRS, meaning that it was above allowable radiation limits due to a failure in the packaging.

Canada has no registry or publicly accessible database of radioactive shipments, or of accidents or **Incidents involving the shipment of radioactive wastes and other materials.**

Transport Canada provides summary statistics of emergencies, which they describe as an incident in which “**the release or anticipated release (e.g. spills, accidents), loss or theft of dangerous goods that is or could be in excess of a quantity or concentration specified by regulation from the means of containment if it endangers, or could endanger, public safety**”. A Class 7 emergency is one in which there is a “level of ionizing radiation greater than the level established in section 39 of the "Packaging and Transport of Nuclear Substances Regulations, 2015".

Year	2023	2022	2021	2020	2019	2018	2017	2016	2015
# of Incidents	9	2	7	14	5	5	8	13	11

Making the waste more secure in its current location is the best safety option.

SAFECAST

Citizen Science & Radiation Data Collection

Louis Bertrand, louis@bertrandtech.ca

Safecast Map — Mozilla Firefox

Safecast Map

Safecast gathers geocoded radiation measurements globally
https://map.safecast.org

ISAFECAST

Crosshair

Location

YERS

List All

ecast 2023-08-18

ints 2023-08-18

erpolation 2023-08-13

ecast Snapshots...

ecast Cosmic 2019-04-07

ecast Points 2013-04-15

ecast Points 2014-03-11

SA Japan 2011-06-30

GS/GSC NURE 1980

oscience Australia 2010

T/GSJ Natural Bkg

GEIGIE LOGS

rch...

nove All

65.54 LOG10
10.09
3.99
2.13
1.31
0.87
0.60
0.43
0.31
0.23
0.16
0.12
0.08
0.05 µSv/h
0.03

Air Sensors
Online
Offline
Particulate →
Max
Latest
Min
Increasing
No Change
Decreasing

Radiation Sensors
Online
Offline
Activity →

Keyboard shortcuts | Map data ©2024 Google | 1 km | Terms | Report a map error

- Nuclear power is a polarizing issue
- Neither pro- or anti-nuclear, Safecast is pro-data

- All data is public domain
- Designs are open source

The Safecast Code – ALWAYS:

- Open
- Improving
- Encouraging
- Publishing
- Questioning
- Uncompromising
- On
- Creating
- Objective
- Independent

SAFECAST

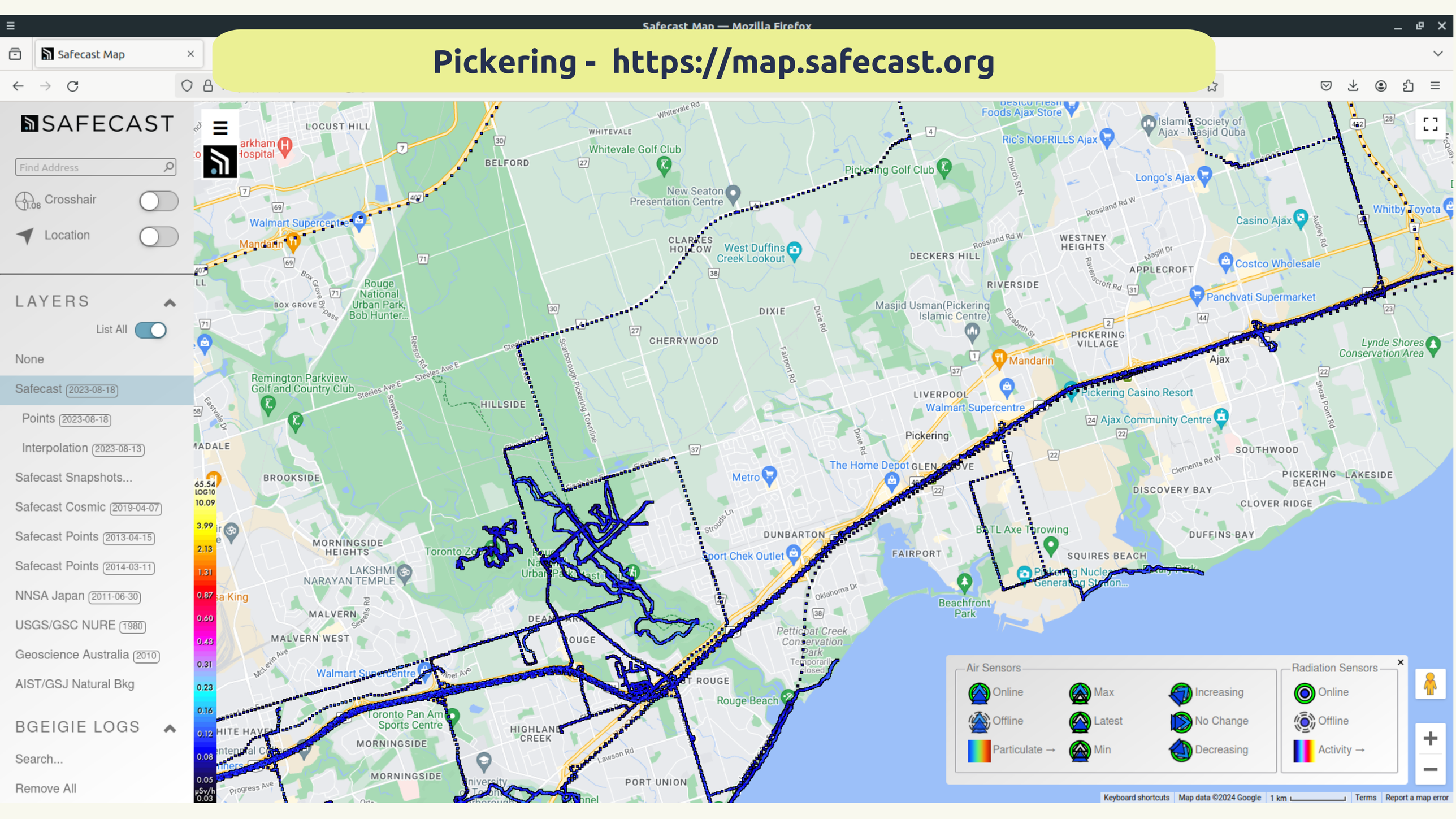
Fine Grain Mapping

SAFECAST

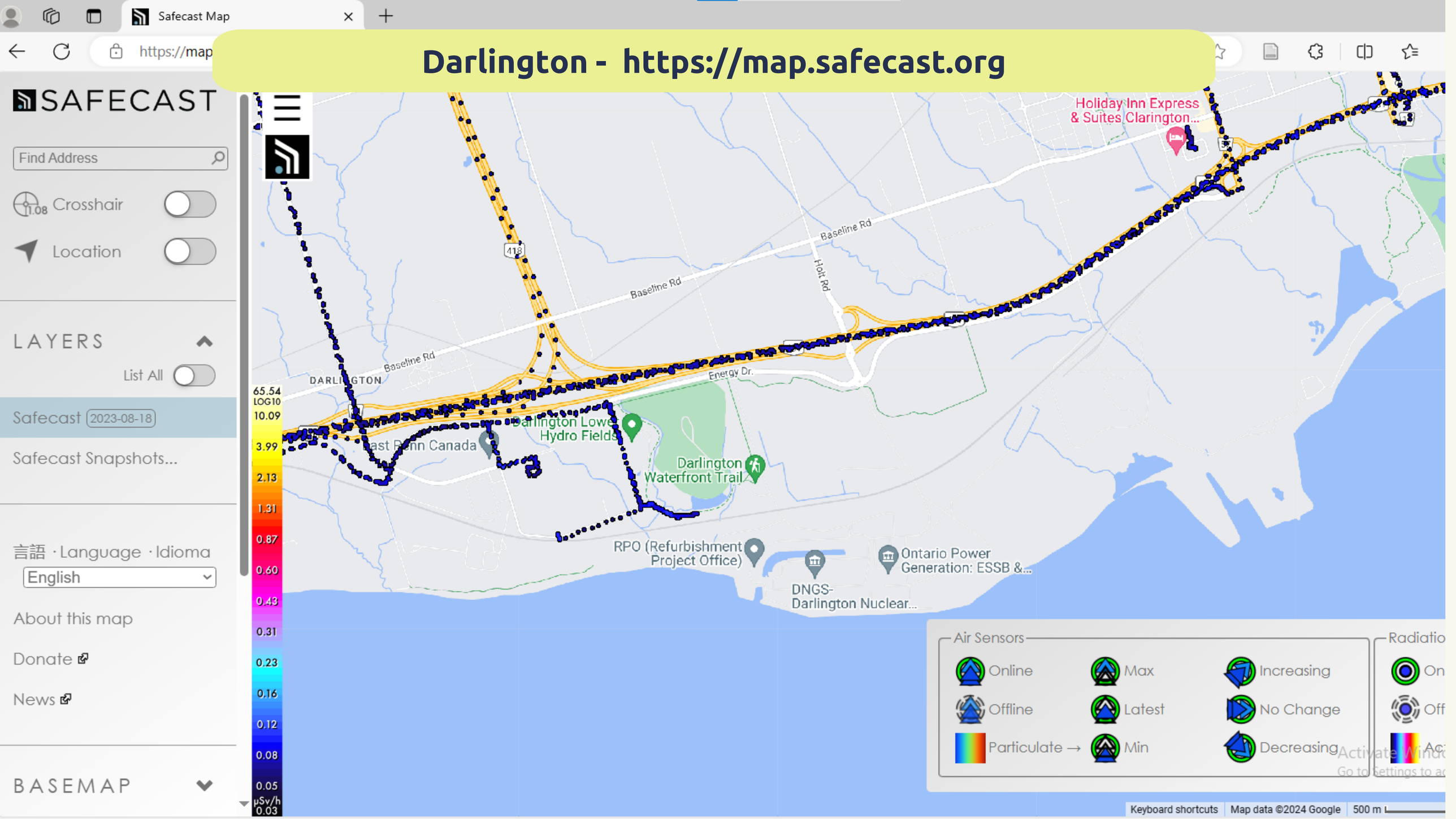
- Averages, aggregates or aerial surveys not helpful
  - In Fukushima, readings varied widely over short distances, sometimes across the street

- The Safecast map:
  - Individual readings, geolocated and dated
  - Base unit micro Sieverts (μSv), like a dosimeter
  - Weighting factor based on Caesium 137 radioisotope

Pickering - https://map.safecast.org



Darlington - https://map.safecast.org



bGeigie Nano

- Award-winning portable workhorse
- LND 7317 5cm pancake tube with MedCom iRover HV supply
- Open-source parts and firmware
- User pulls µSD card for upload from PC
  - Speed bump in data collection
- Can retrofit for fixed continuous logging
  - bGeigie Cast module
- Obsolete parts, difficult build

bGeigie Zen

- Newest Geiger counter in pre-release
- Readings compatible with the Nano
  - Same G-M pancake sensor,
    Safecast designed HV supply
- Zen: Simpler to build
  - Fewer components
  - Highly integrated components
  - DIY kit or ready-to-go
- Zen: Simpler to use
  - WiFi connected for direct upload

The “Ask” – Join Safecast!

SAFECAST

- Safecast-ing can be part of the effort raising awareness around Durham region nuclear power plants
- Big organization, many opportunities to help
- Pro-data, not for- or anti-anything
  (so, not confrontational or political)
- Need better coverage around Pickering, Darlington
- Safecast.org

Opportunities to Engage

Community Involvement

OPG is currently seeking to extend the operation of units 5-8 at Pickering until 2026.
This is a further extension, again far beyond the original engineer design for the plant.
A license hearing has been scheduled **June 19 and 29, 2024**.
Intervention applications and submissions are due **April 29th 2024**
Even sending a short letter with your concerns to the regulator at this link is useful
https://www.nuclearsafety.gc.ca/eng/the-commission/intervention/

Recently, the Ontario government has instructed OPG to seek a license to refurbish (i.e. rebuild) the Pickering nuclear station; which if eventually granted would result in the plant operating for decades longer.
If and when OPG files an application to refurbish the Pickering station, there will be a license hearing before the safety regulator and you could intervene.

Community Involvement

CNSC has just decided the applicability of a 15 year old environmental assessment to the proposed (and different) new SMR technology at Darlington.
As a result, another hearing will begin in as early as the fall of 2024 on the OPG request to construct new nuclear plants but an exact date awaits the EA decision.
You could intervene in that licensing decision.

OPG has just applied for a new ten year license for its existing plants at Darlington.
Funding applications are due and a hearing would occur in 2025 with dates to be set.

Why Intervene?

- Intervening in writing and/or by asking to appear in person before the safety regulator is a very important method for public transparency and safety accountability

- Intervening has nothing to do with whether you support nuclear power or not; it is about ensuring the improved decision making that results from public engagement, especially for safety reasons

Upcoming Hearings

Start Date	End Date	Type	Location	Description
2024-04-01	2024-04-30	Hearing in Writing	Hearing in Writing	Ontario Power Generation - Licence amendment for the Darlington Nuclear Generating Station regarding the commercial production of cobalt-60
2024-06-01	2024-06-30	Hearing in Writing	Hearing in Writing	Ontario Power Generation - Application to change the licensing basis for the Pickering Waste Management Facility
2024-06-19	2024-06-20	Commission Hearing	Hybrid	Ontario Power Generation request to operate Pickering Nuclear Generating Station Units 5-8 to December 31, 2026

What can you do?

1. Get engaged in your community by attending license hearings, summits, webinars etc.

2. Get familiar with emergency preparedness resources (Durham Nuclear Emergency Response Plan / Provincial Nuclear Emergency Response Plan)

3. Visit **Preparetobesafe.ca** to order KI pills

4. Be sure to submit comments in writing to Ontario Power Generation, the Ontario Ministry of Energy, and the regulator, the Canadian Nuclear Safety Commission, about major nuclear decisions taking place in Durham Region, as well as Emergency Management Ontario and Durham Regional and City Councils.

5. Visit the CNSC’s calendar of commission proceedings page for details on relevant public hearings.

What can you do?

Sign up for newsletters and emails from:

- Canadian Environmental Law Association (CELA)
  cela.ca
- Durham Nuclear Awareness (DNA)
  www.durhamnuclearawareness.com
- Northwatch
  northwatch.org
- SafeCast
  - safecast.org

Follow the notices from the Canadian Nuclear Safety Commission for opportunities to participate:
https://www.cnsc-ccsn.gc.ca/eng/the-commission/

Questions