



# Pickering Community Advisory Council Update - Environment Program

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Support

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# Environmental Protection

- Key Policies/Programs
  - Environmental Policy
  - Environmental Management Program
    - ▶ Corporate Wide Environmental Management System (EMS)
    - ▶ Environmental Protection Program
- Operations - Pickering Performance
  - **Groundwater Monitoring**
  - Radiological Emissions
  - Conventional Emissions
  - Environmental Monitoring
  - Unplanned Releases
  - **Fish Impingement**
  - Program Improvements/Future Plans
- Environmental Risk Assessment (ERA)/Predictive Effects Assessments (PEA)

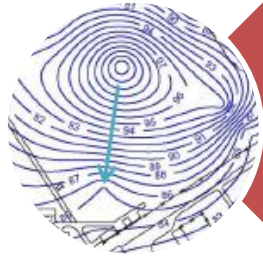


# 2016 Pickering and Darlington Nuclear Groundwater Monitoring Program Results

Presented by Environment - Nuclear

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# Annual Groundwater Monitoring Program Objectives



Verify groundwater flow direction



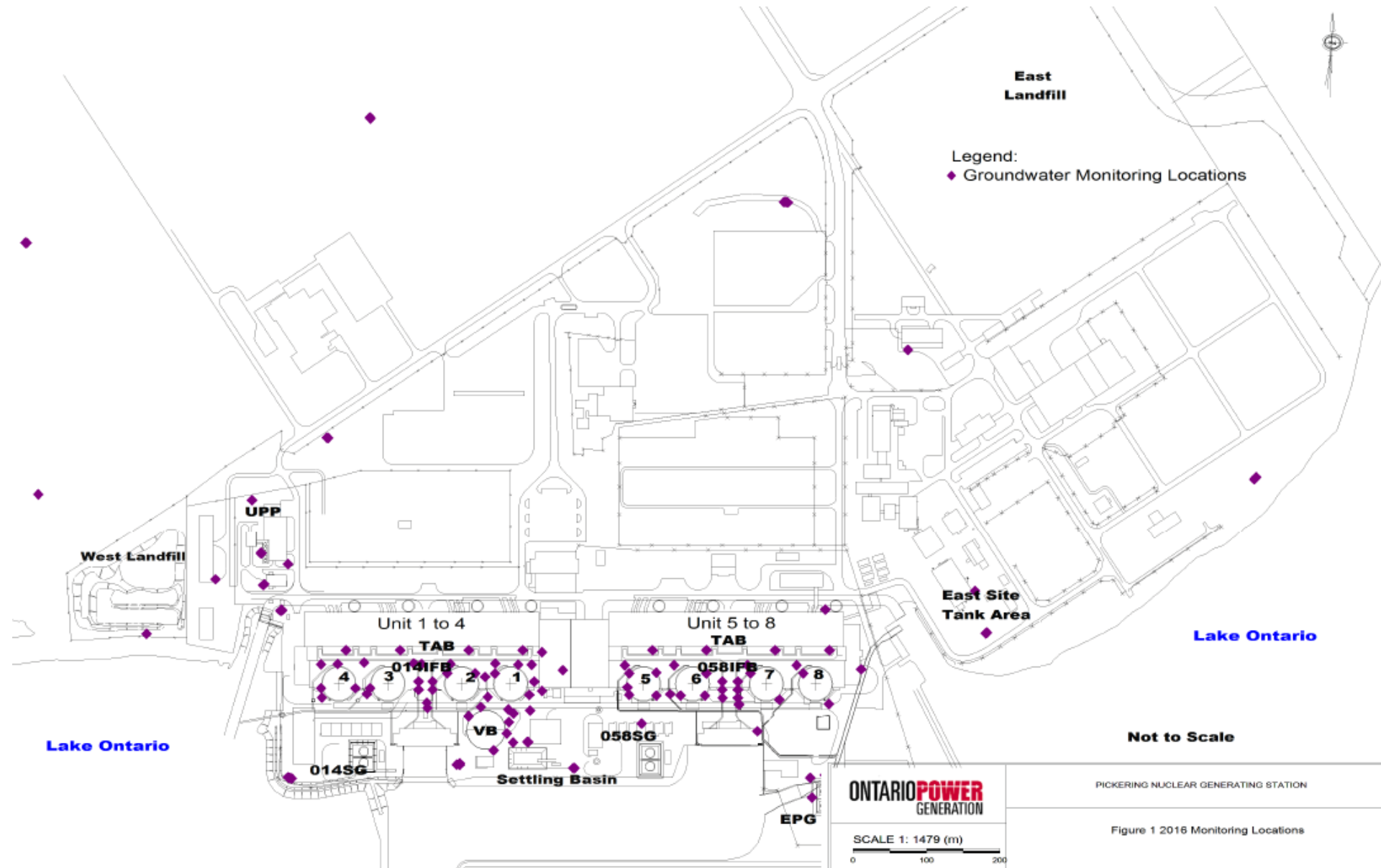
Monitor changes to on-site groundwater quality to identify new issues in a timely manner and assess past contamination issues



Monitor site boundary groundwater quality to confirm no adverse off-site impacts

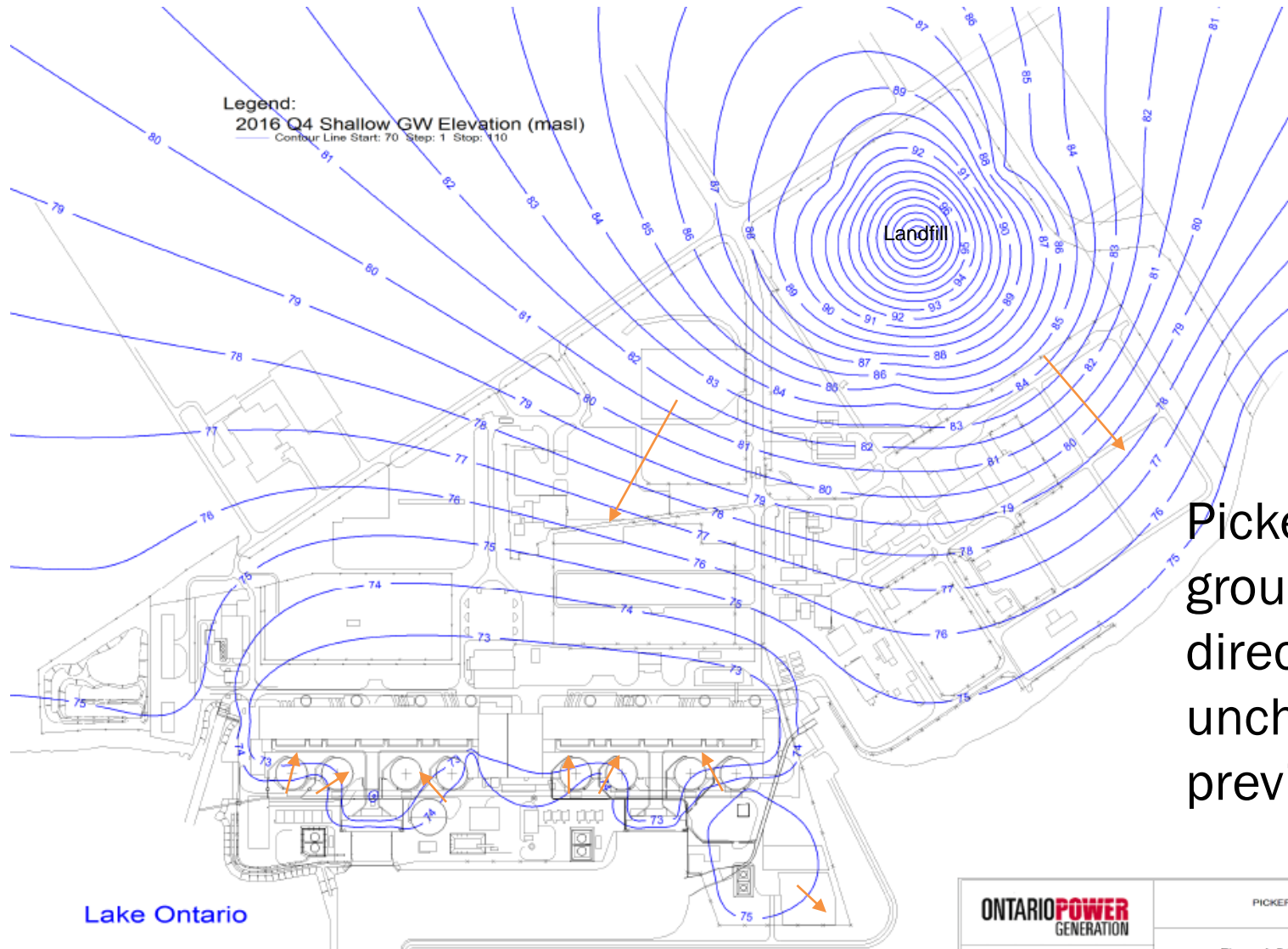


# Overview of Pickering Groundwater Monitoring Program





# Objective 1: Verify Groundwater Flow Direction



Legend:  
2016 Q4 Shallow GW Elevation (masl)  
Contour Line Start: 70 Step: 1 Stop: 110

Lake Ontario

Pickering's  
groundwater flow  
direction remains  
unchanged from  
previous years

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SCALE 1: 1745 (m)

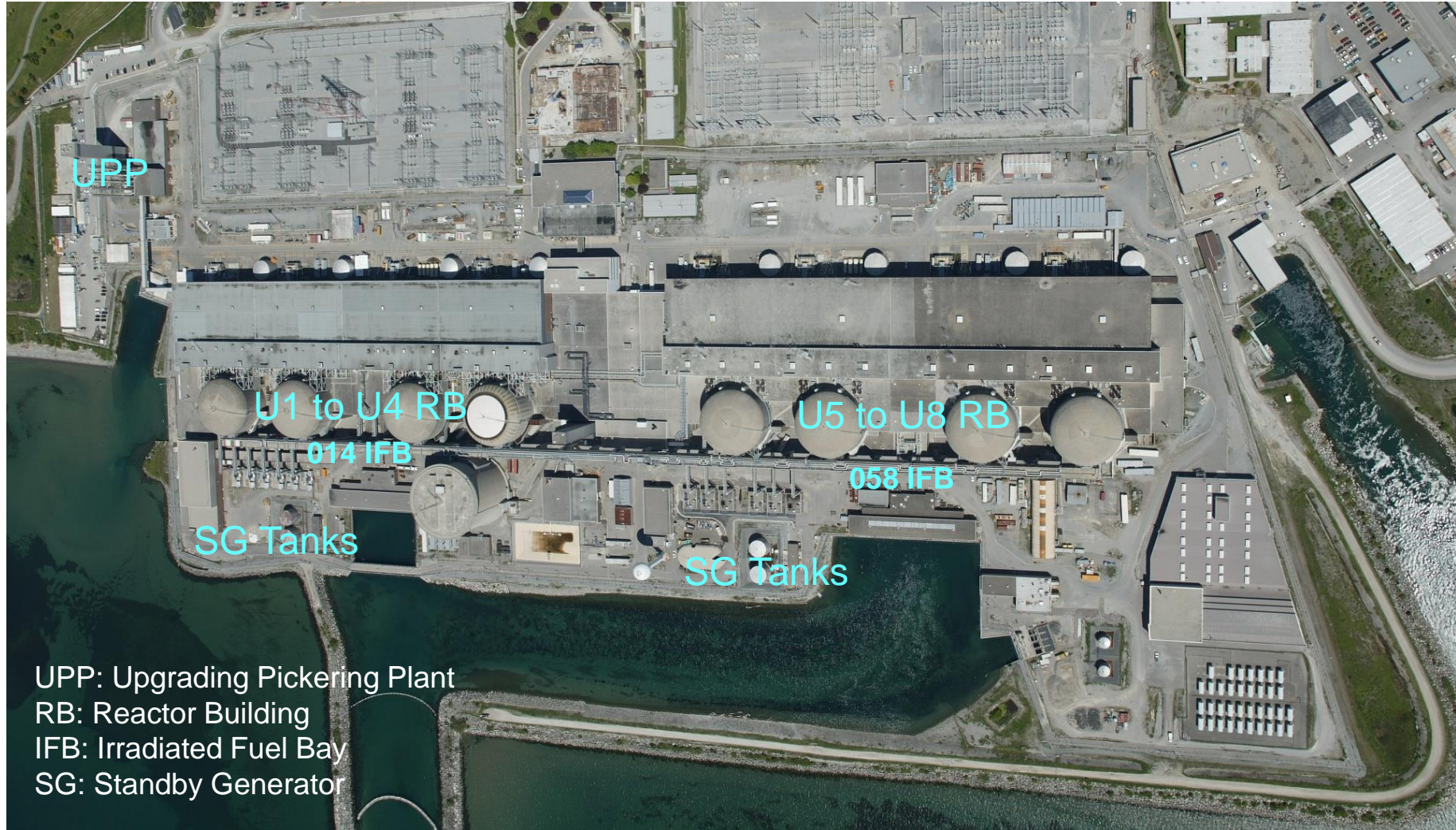
0 100 200

PICKERING NUCLEAR GENERATING STATION

Figure A-5 2016 Q4 Shallow Groundwater Contours



# Objective 2: Monitor Changes to On-Site Groundwater Quality



UPP: Upgrading Pickering Plant  
RB: Reactor Building  
IFB: Irradiated Fuel Bay  
SG: Standby Generator



# Improved or Stable Areas at PN

- Upgrading Pickering Plant
  - Tritium concentrations continue to decrease
- Unit 1 to 4 Reactor Building Area
  - Corrective actions have led to significant reductions in tritium concentrations
- Fuel Oil Storage Tanks
  - The bio-degradation process is naturally breaking down residual, legacy fuel oil in groundwater





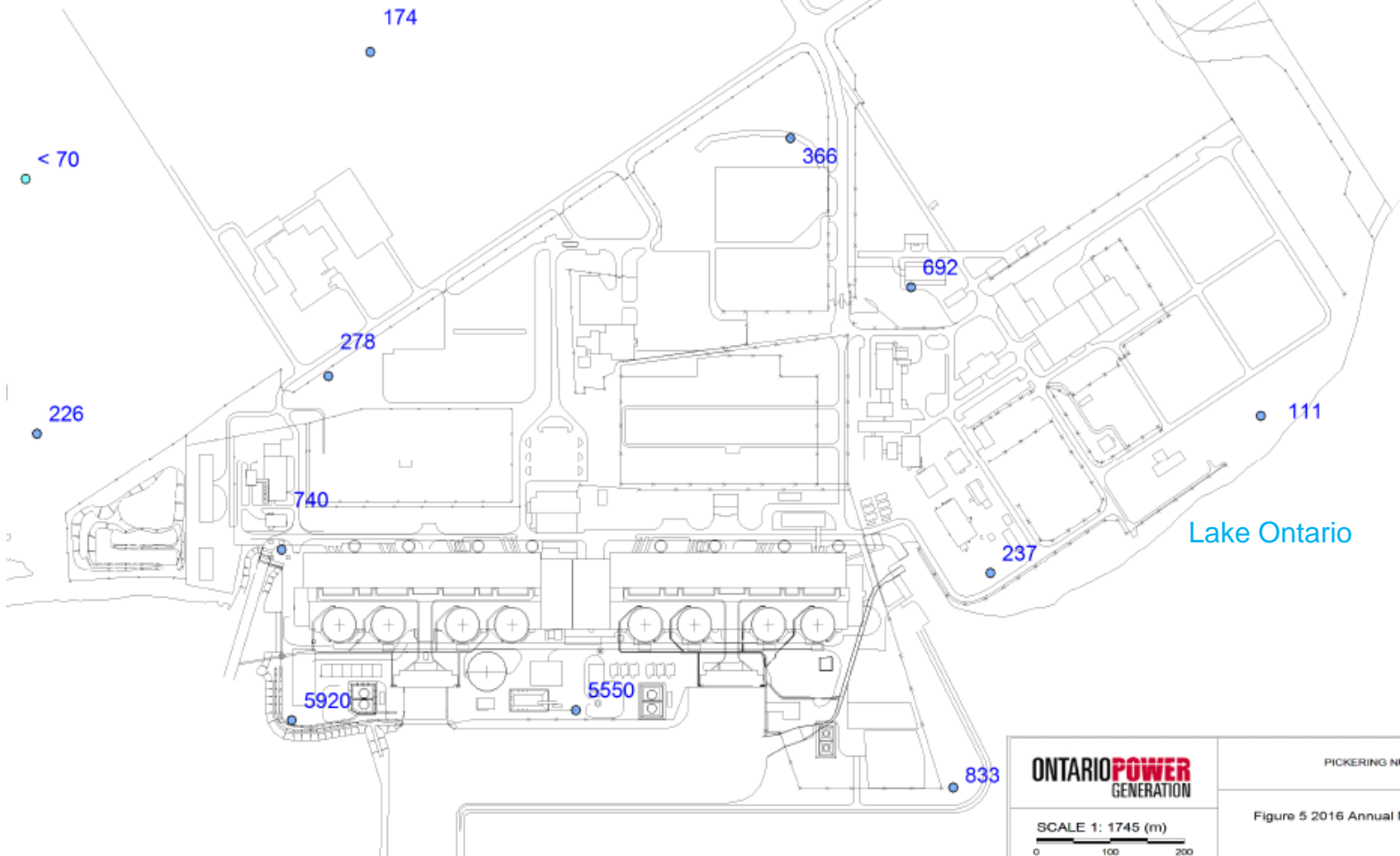
# Two Areas Under Review

- Unit 5 to 8 Reactor Buildings (RB)
  - Historic small leaks from RB foundation drainage sumps
    - ▶ Equipment replaced as required
    - ▶ Work continues as part of an established preventative maintenance program
  - Emerging issue identified in Unit 5/6 RB area in 2016
    - ▶ Detailed investigation conducted and corrective actions implemented
    - ▶ Monitoring will continue
  
- Unit 5 to 8 Irradiated Fuel Bay (IFB)
  - Elevated tritium concentrations in groundwater observed in Unit 5 to 8 IFB area
  - Project underway to mitigate releases from the IFB which involves conducting inspections and repairs, as necessary, to the IFB collection sumps and lining



# Objective 3: Monitor Site Boundary Groundwater Quality

No indications of adverse off-site impacts from Pickering groundwater



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SCALE 1: 1745 (m)

0 100 200

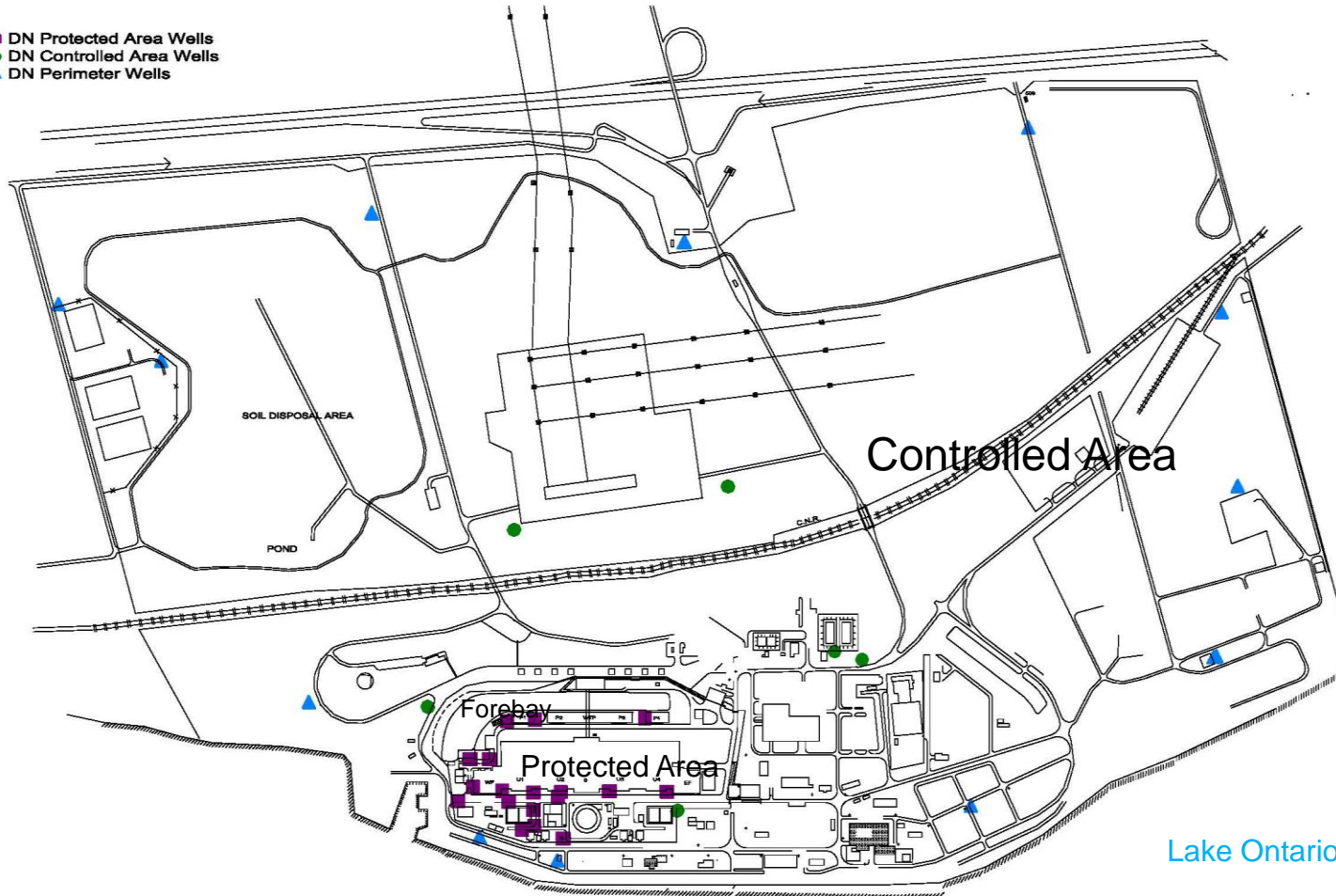
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Figure 5 2016 Annual Max Tritium by Location at Site Perimeter



# Overview of Darlington Groundwater Monitoring Program

- DN Protected Area Wells
- DN Controlled Area Wells
- ▲ DN Perimeter Wells

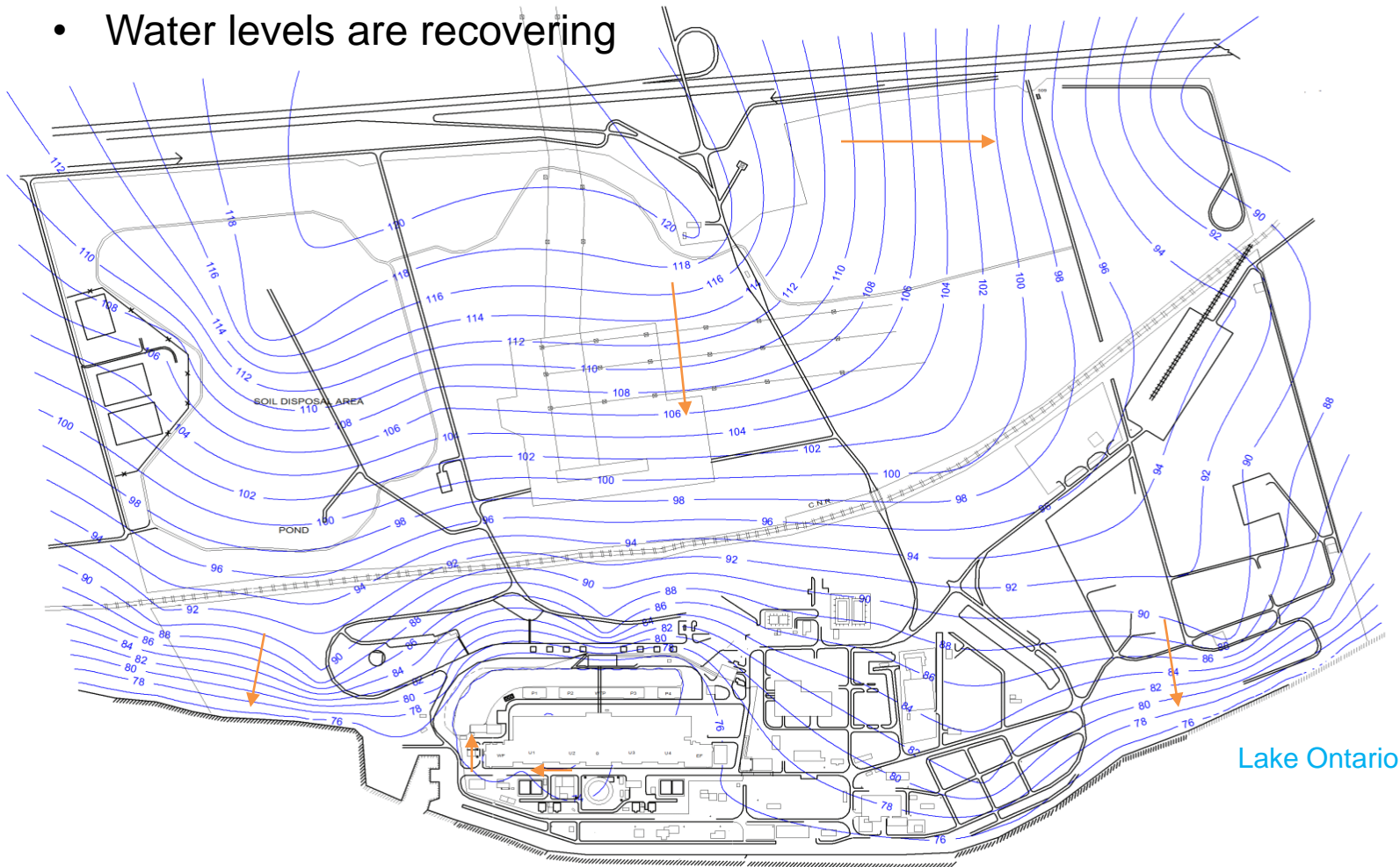


Not to Scale



# Objective 1: Verify Groundwater Flow Direction

- Discrete, local change to Darlington's groundwater flow condition within the Protected Area
- Water levels are recovering





# Objective 2: Monitor Changes to On-Site Groundwater Quality





# Improved or Stable Areas at DN

## ■ Protected Area

- In 2016, monitoring results within the Protected Area confirm that tritium in groundwater is stable at low concentrations

## ■ Controlled Area

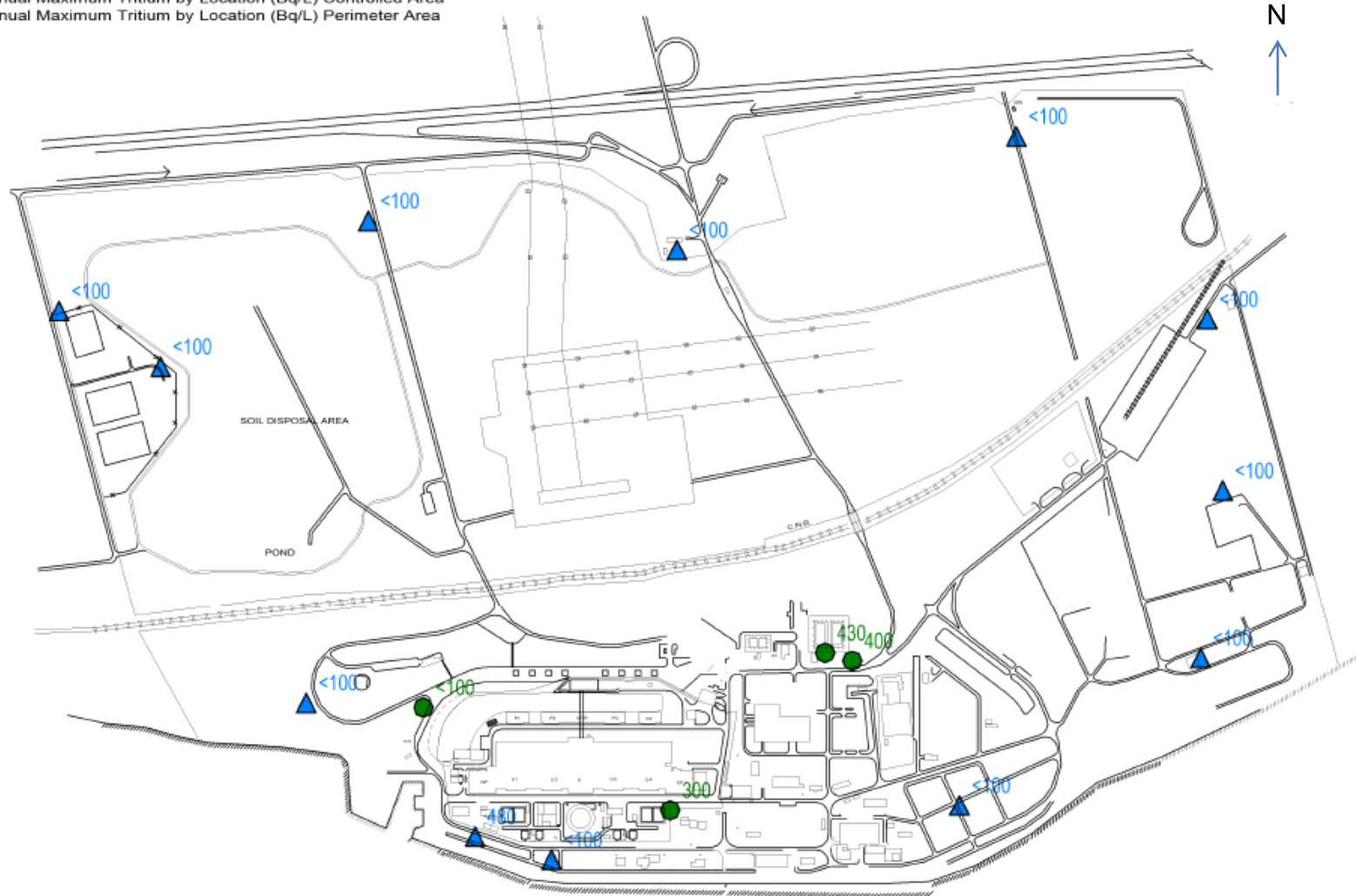
- Tritium concentrations remain low



# Objective 3: Monitor Site Boundary Groundwater Quality

No indications of adverse off-site impacts from Darlington groundwater

- 2016 Annual Maximum Tritium by Location (Bq/L) Controlled Area
- ▲ 2016 Annual Maximum Tritium by Location (Bq/L) Perimeter Area





# Summary

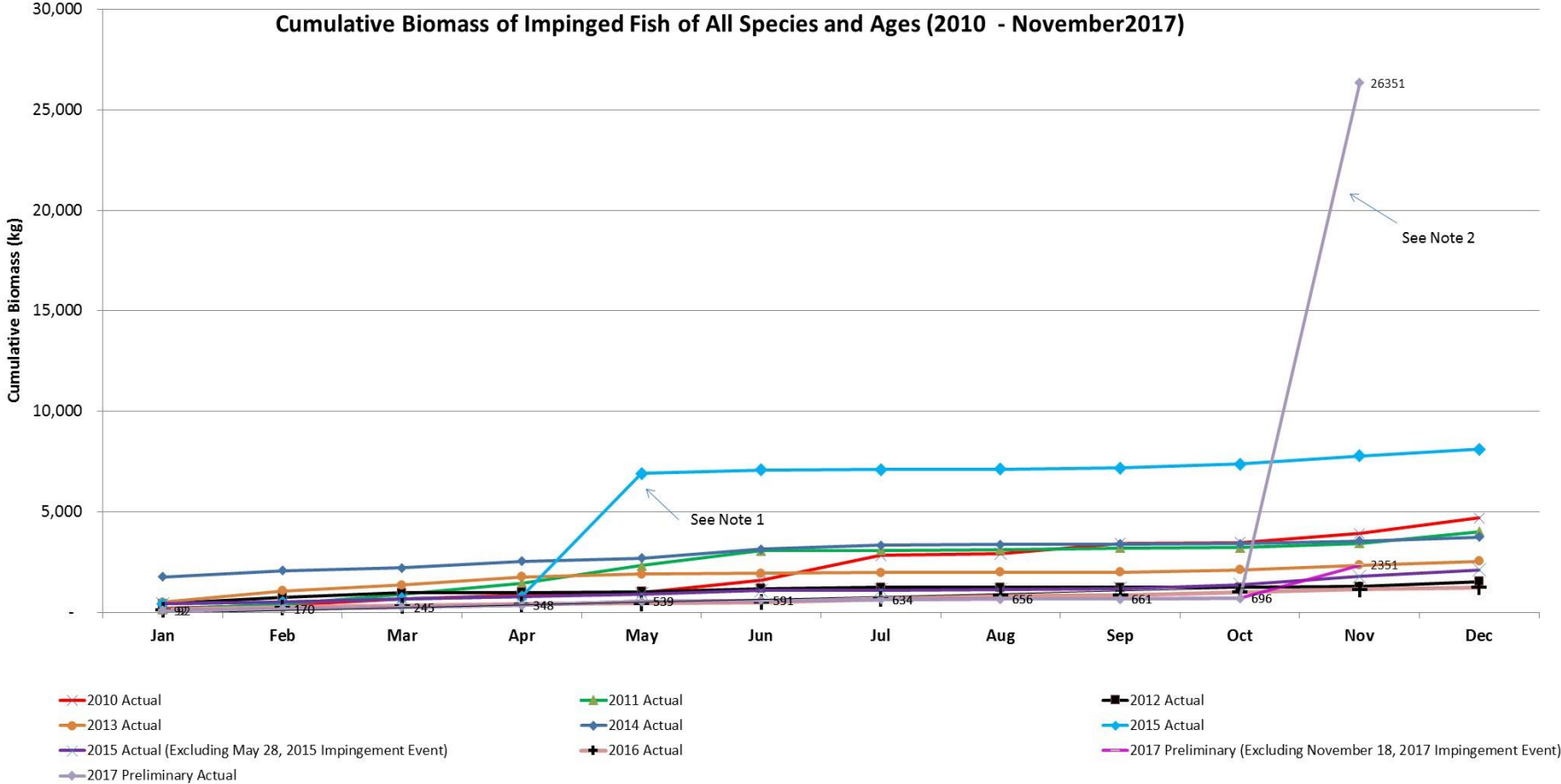
- At Pickering, predominant groundwater flow pattern remains unchanged from the original interpretations
- Discrete, local change to Darlington's groundwater flow condition within the Protected Area continued in 2016
- Legacy groundwater quality results at both sites continue to improve and monitoring will continue
- Emerging issue identified at Unit 5/6 area at Pickering, and mitigation work will continue
- No indications of adverse, off-site migration of tritium at both sites
- Annual groundwater monitoring results reports for both sites are submitted to CNSC





# Fish Impingement

Cumulative Biomass of Impinged Fish of All Species and Ages (2010 - November 2017)



**Notes:**  
<sup>1</sup> Starting May 28 2015, an unanticipated number of primarily Alewife were impinged at the P058 screen house. On May 30, IMS conducted a full integrity inspection of the Fish Diversion System. A 30 foot breach was found at a seam in the net near the West Groyne. The seam was temporarily fixed with the tie wraps that same day and later sewn shut (reference: P-2015-12474, 12440). A conservative estimate of the amount of fish impinged has been determined to be 6000 kg.  
<sup>2</sup> During the night of November 16 and into November 17th Pickering Nuclear experienced an impingement event resulting in higher than normal amount of fish being impinged. Subsequently, during the night of November 19<sup>th</sup>, as part of the same event and while less significant, higher than normal amount of fish was impinged over several hours. OPG's assessment of the situation has concluded that the overall impact resulted in approximately 24,000 kg of fish biomass. This event occurred a few days following the removal of the fish diversion system (FDS). An investigation is underway in an attempt to understand this phenomenon. This is considered to be a Moderate Environmental Event due to the unanticipated number of fish impinged and the regulatory interest around the event.



## ERA/PEA

### Environmental Risk Assessment (ERA)

- Characterization of the baseline environment and assess the human health and environmental risks from PNGS operations.
- Informs our environmental protection program and allows for changes to our monitoring programs

### Predictive Effects Assessment (PEA)

- Evaluation of the potential for adverse effects to human health and the environment resulting from activities associated with transitioning PNGS from operations to a safe storage state.



# Summary

- Pickering Nuclear has a comprehensive Environmental Protection Program designed to continually minimize impacts of station operation to the environment and human health.
- Regulatory oversight and reporting requirements.
- Multiple barriers, checkpoints, and monitoring are in place to ensure radioactive emissions to the environment are within acceptable release limits.
- Given OPG's robust processes that are in place, it is expected that this program area will continue to meet or exceed regulatory requirements and expectations over the 10 year licensing period being sought



# Questions



# Overview

## OPG's Environmental Policy

### Policy Statement:

Ontario Power Generation (OPG) shall meet all legal requirements and any environmental commitments that it makes, with the objective of exceeding these legal requirements where it makes business sense

## OPG Environmental Management System (EMS)

- Corporate-wide EMS which was registered under the ISO 14001 :2004 standard in August 2013.
  - Environmental Protection Program
    - ▶ Groundwater Monitoring Program
    - ▶ Fish Impingement
    - ▶ ERA/PEA



# Environmental Protection Program

- Comprehensive Environmental Protection Programs at our nuclear stations continually minimize impacts of station operation to the environment and human health.
- Nuclear Environmental Programs are regulated by the CNSC, MOE, and Environment Canada.
- Multiple barriers, checkpoints, and monitoring are in place to ensure radioactive emissions to the environment are within acceptable release limits.
- Contingencies and response procedures are in place to mitigate accidental liquid effluent releases. Routine review and practices ensure effective response.



## Framework to Control Emissions

- Based on the guiding principle of As Low As Reasonably Achievable (ALARA) to minimize radiation impacts to the environment and the public.
- ALARA drives continual improvement to reduce emissions.
- Station radioactive emissions are routinely verified against the control framework.
  - Derived Release Limits (DRLs)
  - Action Levels (ALs)
  - Internal Investigation Levels (IILs)



# Current Operations – Radiological Emissions

- 2016 radioactive emissions to air and to water were below 1.7 % of station DRLs

Site Emissions	PN (Units 1-4)		PN(Units 5-8)	
	Bq	%DRL	Bq	%DRL
<b>AIR</b>				
Tritium Oxide	2.2E+14	0.2	4.6E+14	0.2
Noble Gas (a)	1.1E+14	0.3	5.8E+12	0.01
I-131	9.9E+06	<0.01	4.1E+06	<0.01
Particulate	5.5E+06	<0.01	2.4E+07	<0.01
C-14	1.2E+12	0.05	1.2E+12	0.1
<b>WATER</b>				
Tritium Oxide	1.1E+14	0.03	2.1E+14	0.03
Gross Beta/Gamma	6.8E+09	0.4	5.1E+10	1.6
C-14	N/A	N/A	4.7E+09	<0.01

NOTES: NA = Not Applicable, Bq = Bequerels

(a) Units for noble gas emissions are  $\gamma$ Bq-MeV