

# Ground Water Investigation



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# Ground Water Investigation Overview

- ➡ Chronology & Identification of Sources
- ➡ Impact Assessment of Leaks
- ➡ Hydrological Site Model
- ➡ Calculation of Potential Exposure to Public
- ➡ Remediation Strategy
- ➡ Conclusions



# Indian Point Looking South Along the Hudson River



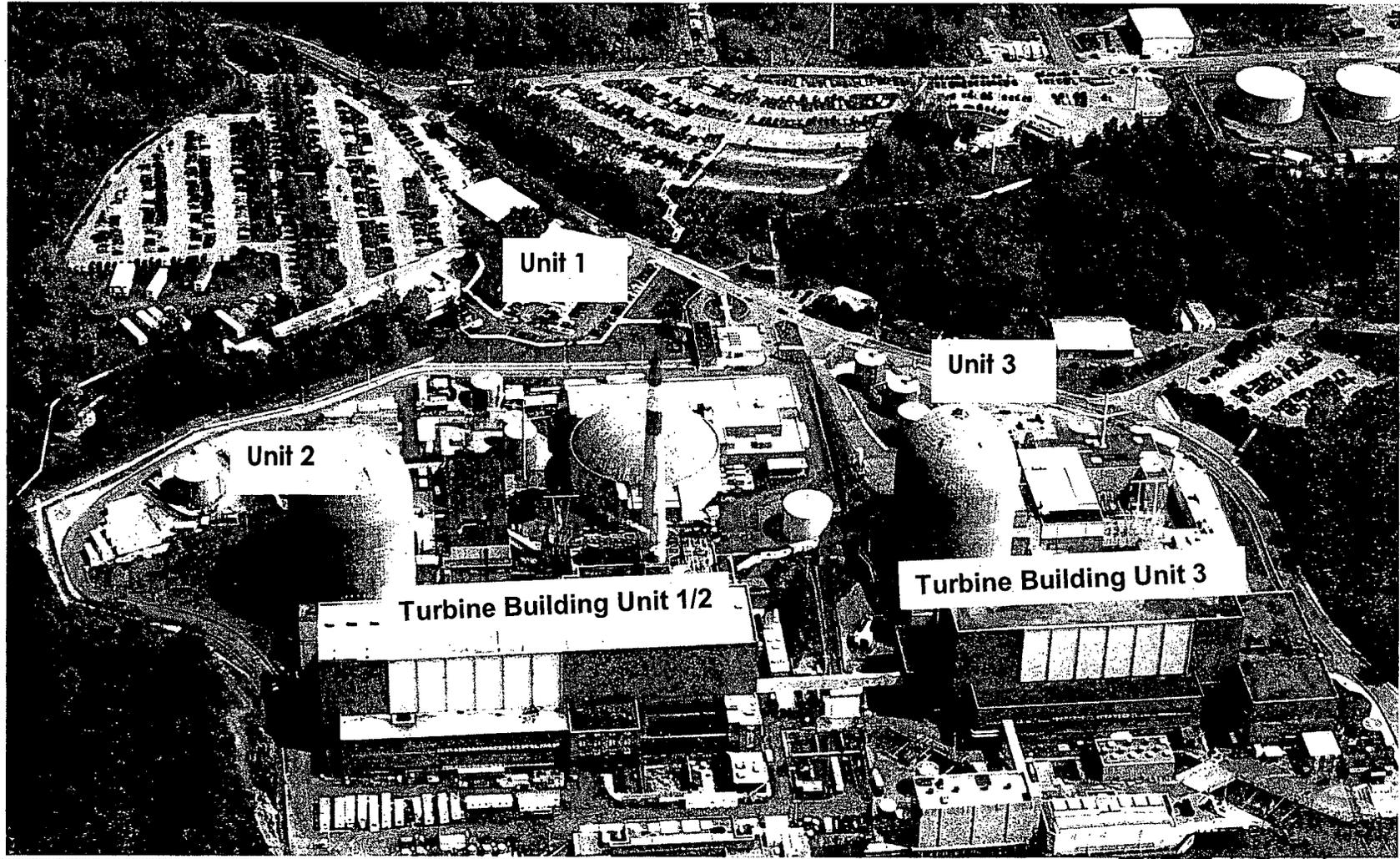
5<sup>th</sup> Street  
Well

Quarry

Gypsum  
Plant

Algonquin  
Outfall

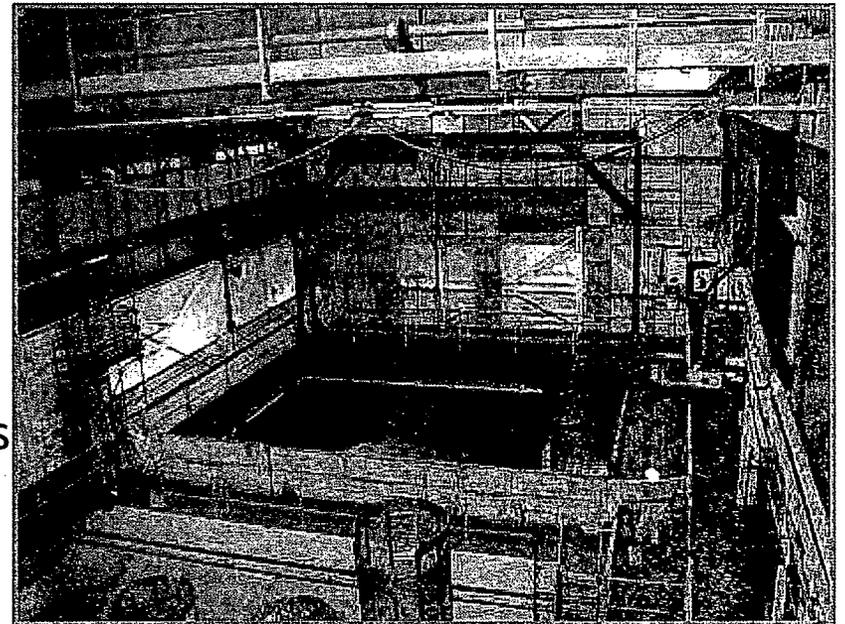
# Overhead View of Indian Point



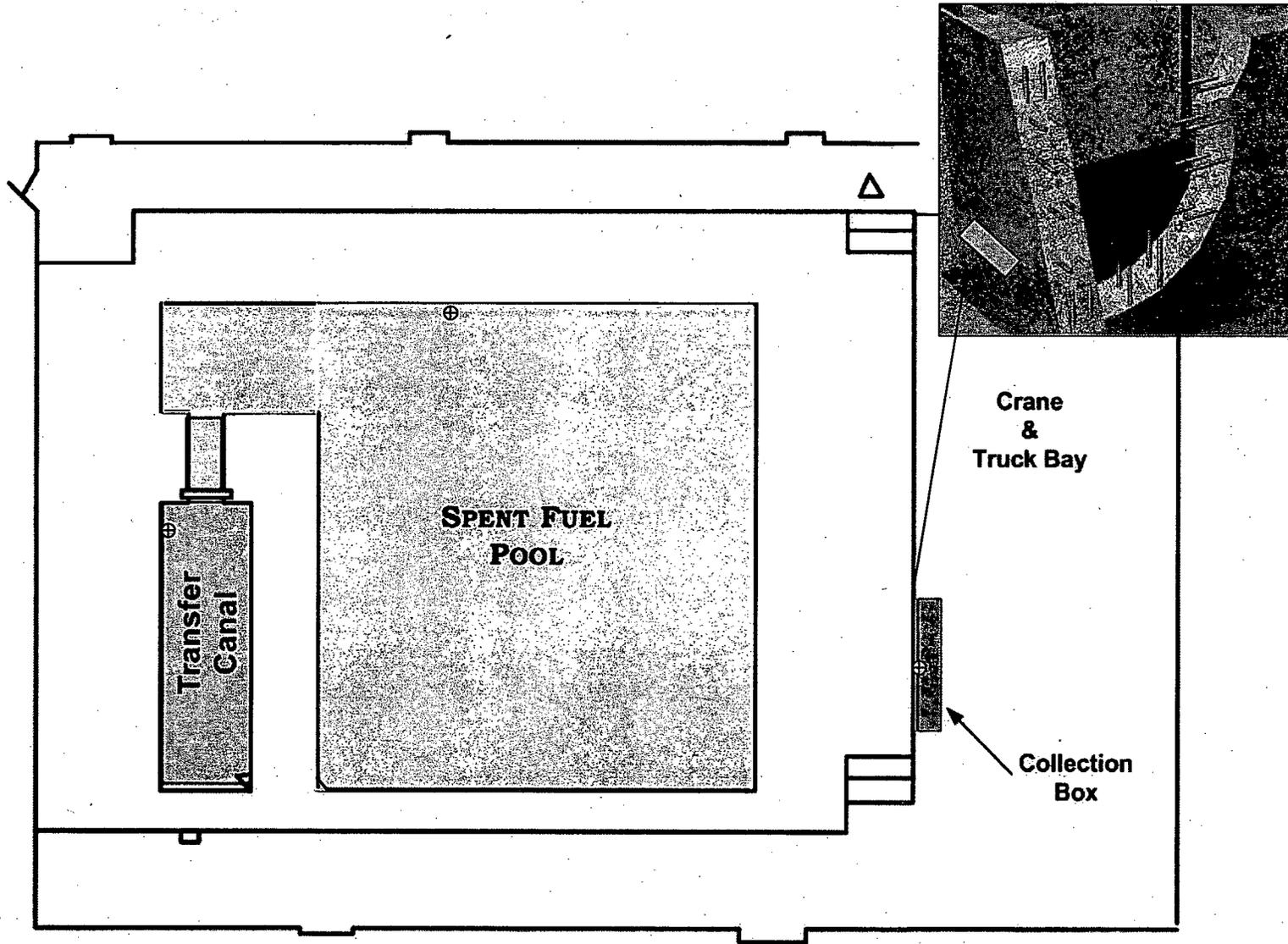
# Identify Sources of Contamination

## *IP2 Spent Fuel Pool*

- Hairline concrete shrinkage cracks identified in Fuel Storage Building wall during 2005 excavation for new gantry crane
- Water collected determined to be of fuel pool origin
- Tested existing wells on site for radioactivity- Tritium detected in the IP2 transformer yard
- Tested off-site wells and water supplies for radioactivity—none detected >BG
- Accessible pool wall areas inspected
- Pinhole defect was identified and repaired in the Fall of 2007

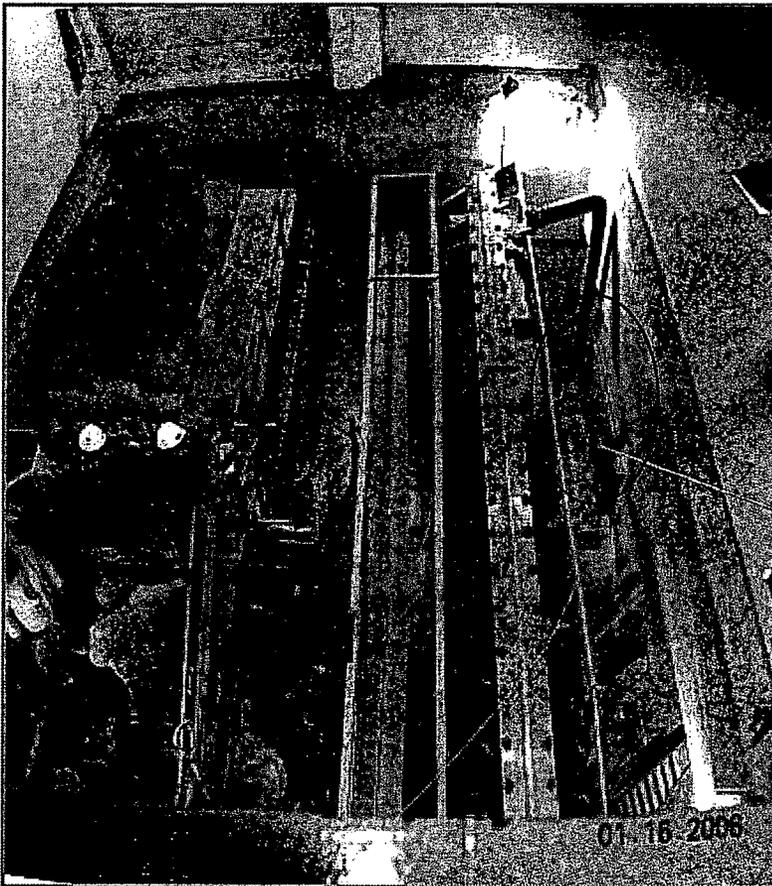


# Unit 2 Spent Fuel Pool Layout



# Identify Sources of Contamination

## *Collection Device – Unit 2*



- Collection device installed to capture water seeping from wall crack
- Volume of water has decreased to essentially zero

Collection box



# IP2 Spent Fuel Pool Liner Inspection

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- Inspected accessible portions of liner with divers and remote video camera (2005-2006), including previously repaired 1992 damage area
- No leaks detected using visual and vacuum box testing techniques,
- Decision made to conduct extensive transfer canal inspections as extension of pool liner
  - Ability to drain and inspect allows even more extensive evaluation for potential degradation mechanisms



# IP2 Transfer Canal Inspection

- Transfer Canal Inspections
  - Evaporation Test
  - Microbiologically Influenced Corrosion (MIC) test
  - Drained and inspected for bleed back
  - Inspected over 730 linear feet of welds
  - Non destructive evaluations
    - Visual
    - Vacuum box
    - Ultrasonic testing
  - Identified 1 through-wall “pinhole” leak
    - Repaired November 2007
  - *Did not identify any degradation mechanisms for pool or transfer canal liner (Key finding)*



# Leak Source Conclusions

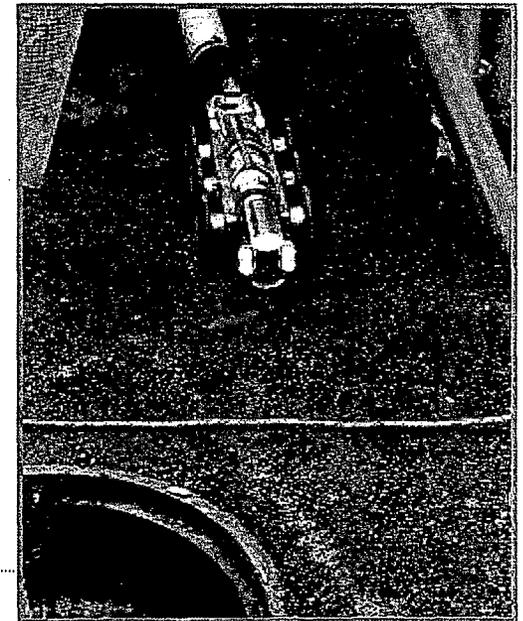
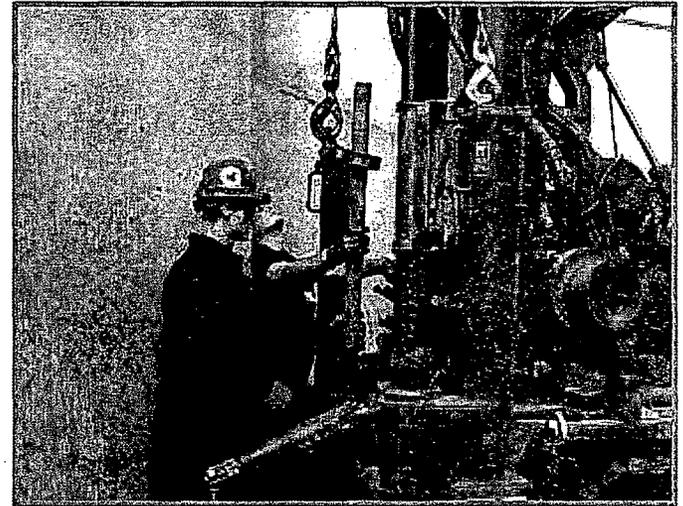
## *Source of the leaks*

- Unit 2 Spent Fuel Pool
  - 1990-1992 leak in liner, which while repaired, resulted in residual local tritium under the pool that contributes to observed ground water concentrations
  - a pinhole defect in the transfer canal which has been repaired
- Unit 1 Spent Fuel Pool
  - Legacy leak which is presently being mitigated with demineralization/filtration technology. This is the source of Sr-90 observed in monitoring wells
- Source effected areas are fully characterized by monitoring wells and the site hydrological model.



# Assessment of Impacts

- Installed over 40 multi-level monitoring wells in three phases
- Developed hydrological model which maps ground water flow and contaminant migration
- Sampled storm drains, river sediment, and fish
- Examined drain systems and other potential conduits of water flow
- Monitored boundaries and riverfront
- Calculated potential dose to public





CAMP FIELD RESERVOIR  
LOCATED 2 MILES NORTHEAST  
OF SITE AT ELEVATION 370'

NEW CROTON RESERVOIR  
LOCATED 3.2 MILES SOUTHWEST  
OF SITE AT ELEVATION 280'



HUDSON RIVER  
ELEV. = 1.5'

**GROUND SURFACE  
ELEVATION IN FEET**

- 140 - 150
- 130 - 140
- 120 - 130
- 110 - 120
- 100 - 110
- 90 - 100
- 80 - 90
- 70 - 80
- 60 - 70
- 50 - 60
- 40 - 50
- 30 - 40
- 20 - 30
- 10 - 20
- 0 - 10

# Tritium Map

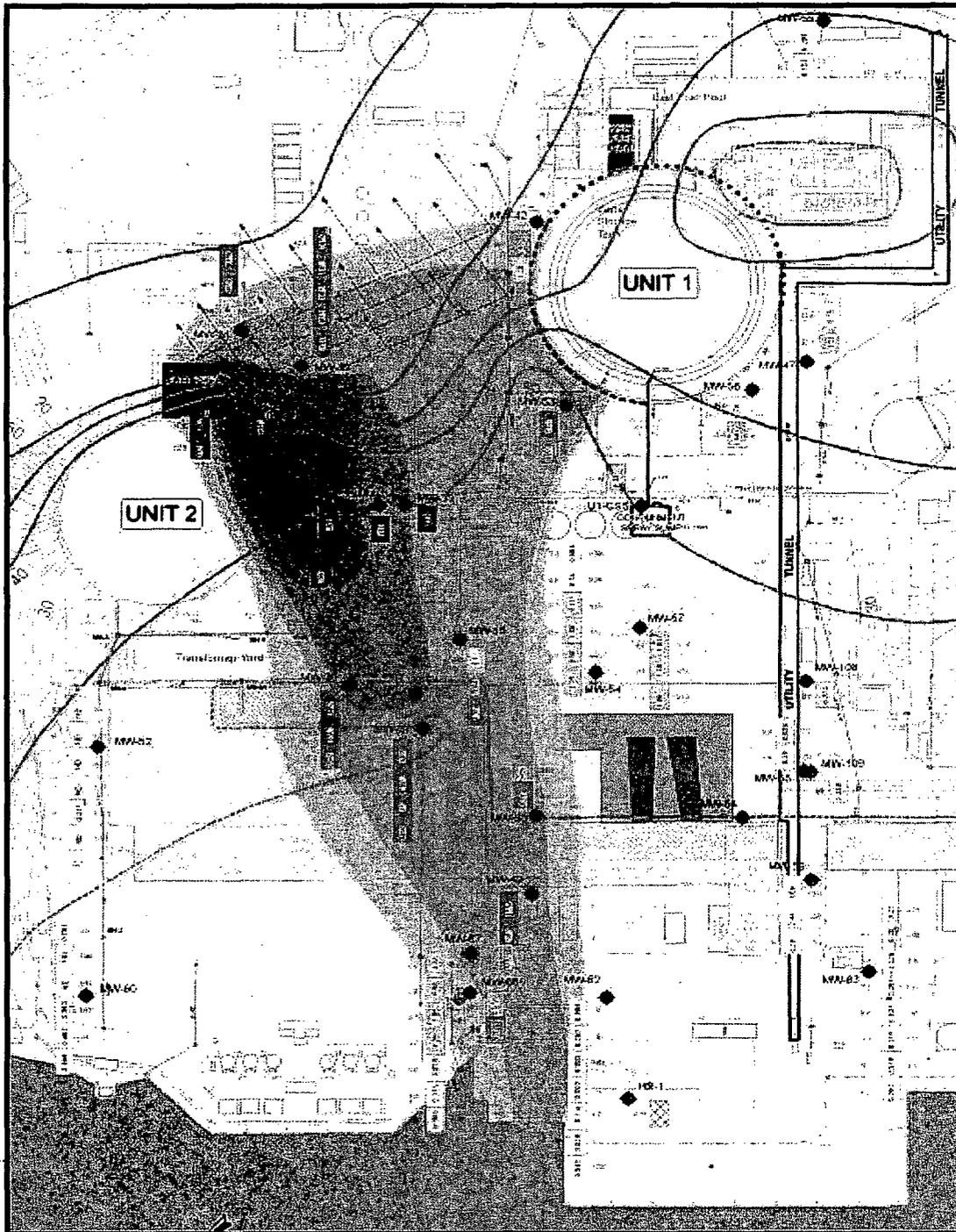
Tritium migration from Unit 2 Pool leakage.

Minor contribution from Unit 1

Circles indicate monitoring well placement

Concentration drops toward river

Plume diluted to non detect at river



# Sr-90 Map

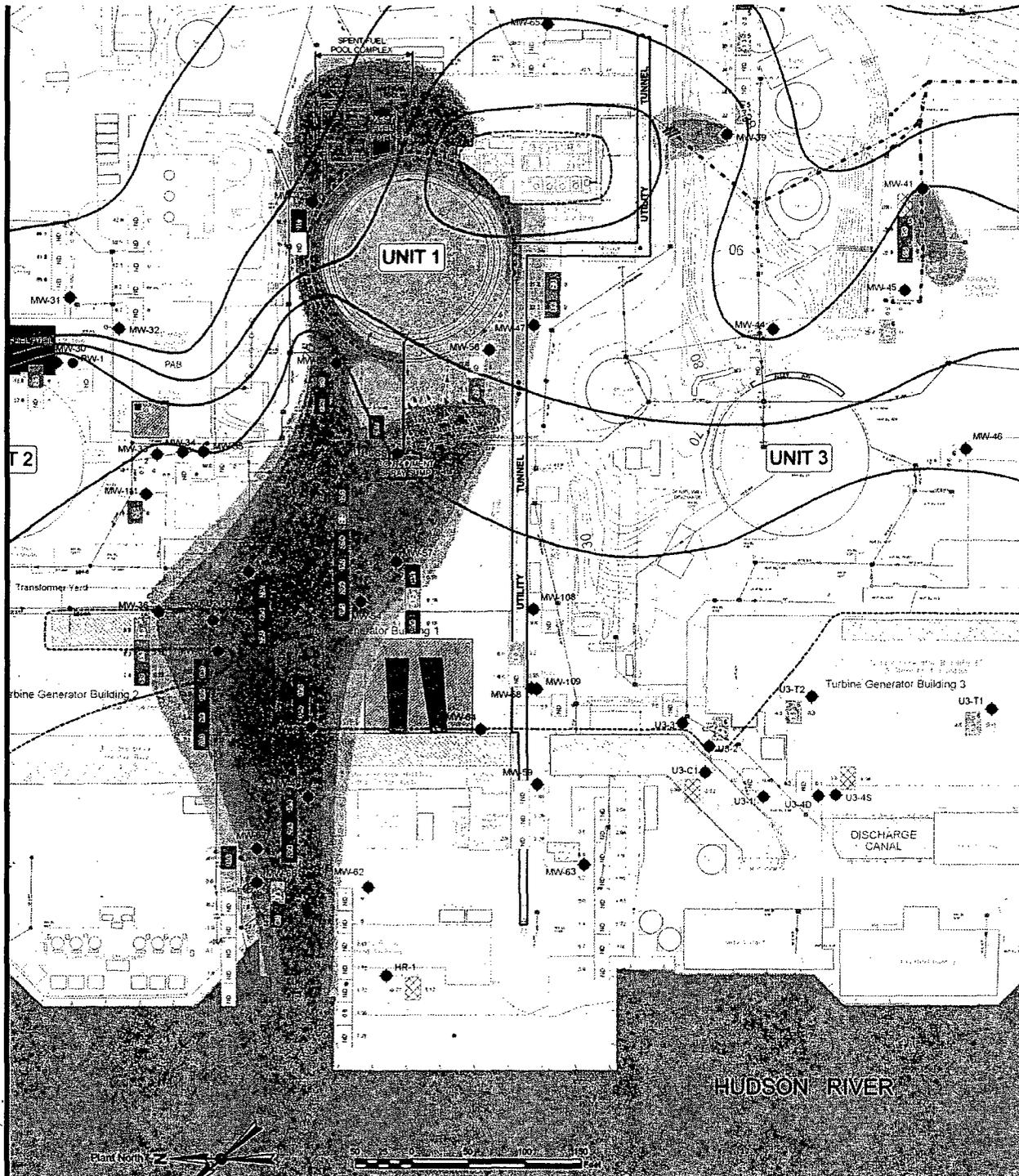
Strontium migration from Unit 1 Pool leakage.

Circles indicate monitoring well placement

Concentration drops toward river

Plume diluted to non detect at river

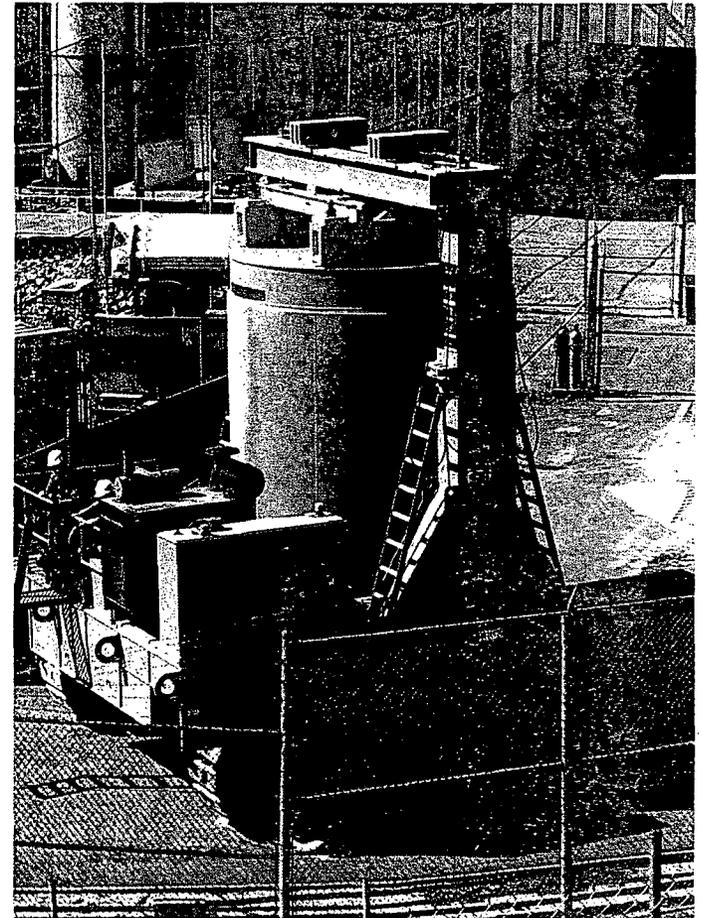
Legacy contamination from old Unit 1 piping east of Unit 3



# Remediation Strategy Unit 1

## 2 Stop Pool Leakage

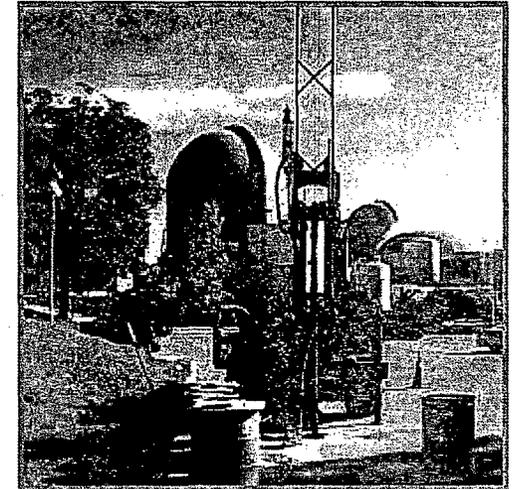
- Leak source elimination by removal of IP1 spent fuel from pool, Complete Fall 2008
- Drain IP1 pools after fuel removal (Dec 2008)
- Over time, groundwater concentrations are expected to decrease
- Groundwater attenuation trends will be assessed through long term monitoring



# Long-term Ground Water Monitoring

## Purpose

- Monitor status of current plumes
- Collect data to calculate potential doses due to GW
- Provide timely identification of potential new leaks
- Monitor effectiveness of any remediation / intervention actions



# Long-term Ground Water Monitoring

## Program Elements – Monitoring Wells

- Boundary and Riverfront wells
- Selected wells along affected areas of the site
- Frequencies established for long-term monitoring
  - Quarterly, Semi-annual and Annual
- Investigative criteria and actions defined
- Institutionalized in plant procedures



# Remediation Strategy

Source Control/Elimination combined with monitored natural attenuation

- Unit 1
  - Continued source control via in-pool demineralization system
  - Source elimination via complete fuel removal and pool draining (2008)
- Unit 2
  - Unit 2 transfer canal liner pinhole repair (leak cessation)
  - Continued utilization of existing wall collection box (control)
- Long-term program to monitor plume attenuation (reduction) and provide for early identification of new potential leaks.



# Conclusions

- **No impact to public health or safety from ground water contamination at Indian Point**
- **No contamination observed in off-site wells or reservoirs**
- **Calculated doses are less than 1% of regulatory limits, and no actual contaminants attributable to the plant have been detected in the Hudson River water or fish.**
- **Source of leaks have been identified**
- **Remedial actions have been implemented with final actions to be completed by yearend 2008.**

