

Responses to CAC Comments on Freon-11 Groundwater Contamination

Bill Dorsch

Environmental Protection Division
Groundwater Protection Group

Ed Murphy

Energy & Utilities Division
F&O Chief Engineer

BNL Community Advisory Council

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Agenda

- ❑ Brief overview/review of plume details
- ❑ What has been done so far?
- ❑ Responses to comments raised at September meeting
- ❑ Next steps

Plume Overview/Review

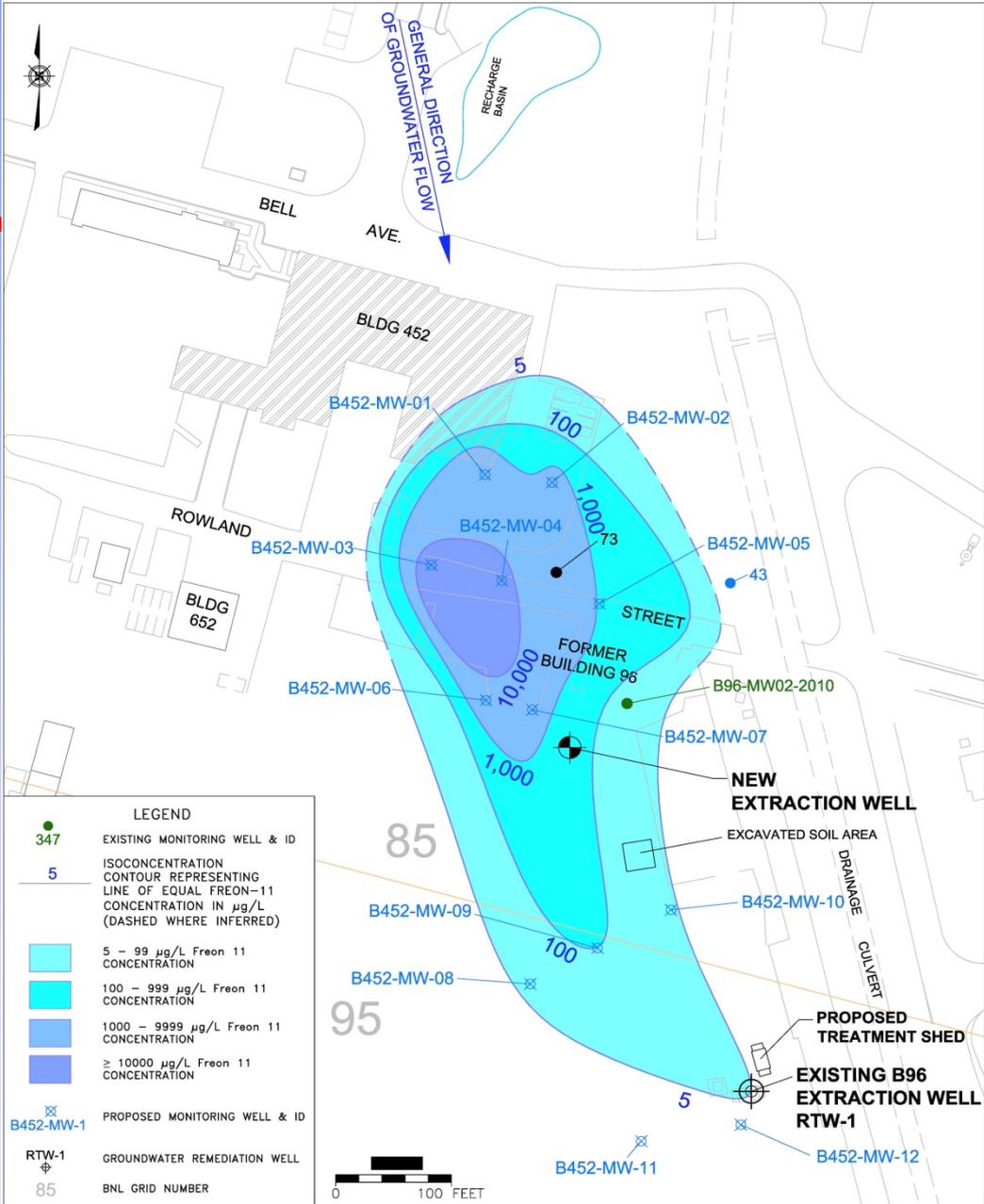
Freon-11 Release at Building 452

Extent of contamination

- Plume 300 ft. wide, 600 ft. long.
- Maximum concentration = 36,000 µg/L.

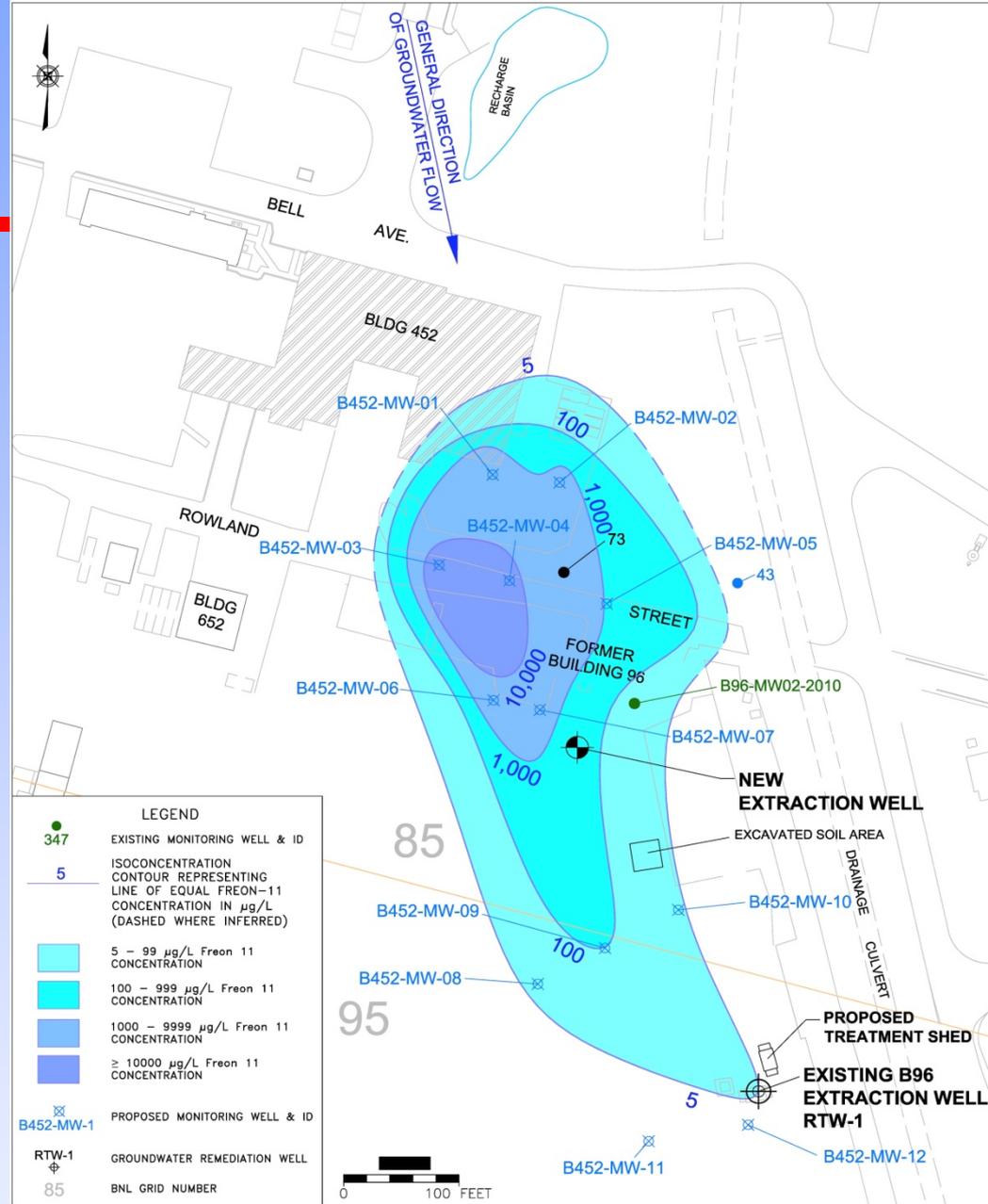
Source of contamination

- Building 452 (AC Shop) area
- Based on length of plume spill probably occurred 2 to 3 years ago.
- Estimated amount of Freon-11 in groundwater is 15 to 25 gallons.



What Has Been Done So Far?

- Developed plans to hydraulically control and remediate plume early for maximum efficiency
 - Previous success remediating the Carbon Tetrachloride plume.
- New extraction well was installed to capture high concentration portion of plume.
- Existing Building 96 extraction well RTW-1 will capture lower concentration part of the plume.
- 12 new monitoring wells were installed
 - Monitor groundwater near Building 452 for the next year to determine if there is a continuing source of Freon-11.



CAC Comment:

Is it better to leave the Freon-11 in the ground?

- According to the OU III Record of Decision on groundwater approved by EPA, NYSDEC, and DOE, the Laboratory must:
 - ✓ Meet the drinking water standards in groundwater for VOCs (the drinking water standard for Freon-11 is 5 $\mu\text{g}/\text{L}$; highest concentration observed was 36,000 $\mu\text{g}/\text{L}$)
 - ✓ Prevent or minimize further migration of contaminants
 - ✓ Complete clean-up of the Upper Glacial Aquifer by 2030

CAC Comment:

What are the regulators' concerns?

- Regulatory framework for remediation and method of public outreach.
 - Regulators, DOE and the Lab are working on an approach that will meet everyone's needs. BNL/DOE recommended:
 - Include the plume under the OU III ROD
 - Designate the location a new Area of Concern (#32)
 - Document with an Explanation of Significant Differences (ESD)

CAC Comment:

What alternatives have been evaluated?

1. Liquid Phase Granular Activated Carbon (GAC)

- No air emissions
- Poor removal efficiency
- Cost \$900K greater than air-stripping (based on 3 year project life-cycle)

2. Air Stripping (with air emissions treatment)

- High removal efficiency
- Air emissions treated with GAC
- Cost \$100K greater than no air emissions treatment (based on 3 year project life-cycle)

3. Air Stripping (without air emissions treatment)

- High removal efficiency
- Some air emissions (within regulatory limits)

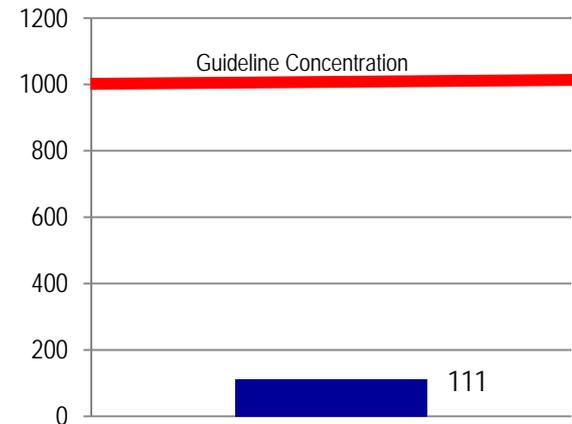


CAC Comment:

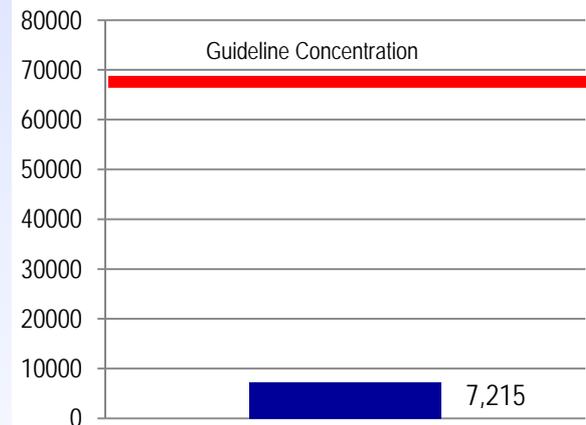
What option did you select and why?

- Air Stripping (without air emissions treatment)
- NYSDEC Division of Air Resources (DAR)-1 Screening Model
- Model assumptions: Freon-11 concentrations of 36,000 $\mu\text{g/L}$ and treating 120 gals/min
- Modeled emissions from the air stripping system using the highest concentrations observed
 - Projected result was 1/10th of the NYSDEC guidance

Maximum Annual Impact ($\mu\text{g/m}^3$)



Maximum Short Term Impact ($\mu\text{g/m}^3$)



CAC Comment:

What option did you select and why? (continued)

- Used NYSDEC Air Guide 20 “Economic and Technical Analysis for Reasonably Available Control Technology” to evaluate cost to treat air emissions.

Assumption

- GAC filter captures 0.05 tons/yr.

Results

- NY State guidance for VOC treatment (what is reasonable) = \$5,000/ton
- Estimated treatment cost = \$356,000/ton

Emissions Comparison

Air Stripper Emissions

- Estimated 15 – 25 gals in groundwater
- Operation for approximately 3 years
- Approximately 100 lbs./yr.

Ozone Depleting Substance Equivalents (~ 100 lbs/yr)

- 2- Halon 1211 portable fire extinguishers



Next Steps

- Complete construction of treatment system
- Begin system operation early 2012
- Continue progress updates to CAC, BER, Lab community



Ed Murphy

Energy & Utilities Division

F&O Chief Engineer

What Actions Have You Taken to Better Secure BNL's Refrigerant Inventory?

Secure Storage

- All R-11 was moved to CCWF, Bldg. 600
 - Building is staffed / supervised 24/7/365
 - Improved temperature control
 - R-11 & R-123 drums stored on secondary containment
 - CCWF has a refrigerant detection system – alarms to BNL fire department
- “Re-purposed” a hazardous material storage building for high pressure refrigerant storage
 - 80% complete (waiting for new cylinder racks, signage and communications)
 - Building designed for hazardous material storage
 - Card reader access – records who accesses building



Re-Training

- Info session for A/C engineers – R11 and groundwater

What Plans Do You Have to Better Secure BNL's Refrigerant Inventory?

Better Inventory Management

- Maintain refrigerant log (inventory) in CCWF
- Studying moving all high pressure (gaseous) refrigerant inventory to new storage building
 - Evaluating high pressure refrigerant log



Refrigerant Management Plan Revisions

- Update for:
 - New storage locations
 - New inventory management procedures
 - Organizational changes and job titles



Questions