

## Groundwater Monitoring and Relevance to LTP Compliance

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Meeting with USNRC September 15, 2005

# **Discussion Topics**

- ♦ LTP Compliance Criteria
- Soil Characterization Results
- Tank Farm Bedrock Contamination Status
- Groundwater Monitoring Results
- Groundwater Modeling Results
- Going Forward Monitoring Plan
- Groundwater Recharge and Recovery from Dewatering
- Actions Prior to Start of 18 Month Groundwater Monitoring Period



### LTP Compliance Criteria Dose Modeling and Final Status Surveys

Land Areas

- Three dose pathways included

» Soil

- » Existing Groundwater
  - Areas impacted by aquifer plume

» Future Groundwater

From concrete using the "Basement Fill Model"





## LTP Compliance Criteria Site Release Criteria

#### ♦ NRC

- 25 mrem/yr TEDE from all pathways plus ALARA
  - » Administrative targets
    - ♦ 8 mrem/yr allotted to soil (Industrial Area)
    - ♦ 2 mrem/yr allotted to future groundwater (Basement Fill Model)
    - 9 mrem/yr existing groundwater
    - ♦ Total of 19 mrem/yr corresponding to State of Connecticut criteria

#### State of Connecticut

- 19 mrem/yr TEDE from all pathways plus ALARA
- Additional criteria to meet EPA Maximum Contaminant Levels (MCLs) demonstrated by monitoring well sampling

#### Soil/Bedrock Remediation Target

Remediate media that could affect the ability to meet MCL concentrations in groundwater at time of property transfer



#### LTP Compliance Criteria

Determination of Existing Groundwater Dose

- ♦ Requirements at time of notification of the NRC of the intent to release an area from the license:
  - Use highest concentration measured at any point in the survey area or within the capture zone radius (100 meters) of any point in the survey area
  - Monitoring well to be used in the dose calculation will have been sampled quarterly for at least 18 months including two spring high water periods
  - Sample results trend has shown groundwater concentrations in the highest concentration monitoring well to be steady or decreasing
  - Existing groundwater dose calculated by dividing groundwater concentration(s) by groundwater DCGLs and comparing the result to the GW target dose

#### LTP Compliance Criteria

Start of 18 Month Groundwater Monitoring Period

- ♦ Fate and Transport simulations have determined the projected area of highest groundwater concentration
- Existing and new groundwater wells are in place to adequately monitor the area(s) of anticipated highest groundwater concentrations
- In areas where remediation has been conducted below the average water table using groundwater suppression:
  - Remediation has been completed
  - Excavation has been backfilled
  - Groundwater depression has been ended
  - Groundwater elevation returned to normal levels





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#### **Rad Remediation Below Groundwater Table**

Soil Characterization Results Summary of Soil Sample Results

- Extensive subsurface soil sampling program conducted since 1997
- All suspect areas sampled to bedrock or 24+ feet below grade
- Few low potential areas remain to be sampled and results evaluated
- Only remediation below normal water table remaining is bedrock in Tank Farm area
- Bedrock remediation in Tank Farm area to be completed by end of September



# Tank Farm Bedrock Contamination Status

- Radiological contamination observed in bedrock fractures in area of former tank farm and ion exchange building.
- Contaminated fractures were characterized using down-hole gamma spectroscopy and off-site laboratory analyses.
- ♦ Deepest contamination observed at 11.5 feet below top of rock (about -2 ft MSL).



## Tank Farm Bedrock Contamination Status

- Contamination exceeding groundwater protection screening concentration has been bounded by additional sampling and analysis.
- Fractured bedrock exceeding screening concentration will be removed.





# Groundwater Monitoring Results

- Plant-related nuclides detected in June 05 sampling event:
  - Sr-90,
  - Tritium
- Historic nuclide detections have included Cs-137, Co-60





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# Groundwater Modeling Results

Model Domain Map
Model Domain Bedrock Surface Map
Particle Track from Operational Period
Particle Track from Post-Closure Period





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# Groundwater Modeling Results – Description of Layers

Groundwater Model Layer Descriptions				
Layer Number	Stratigraphy Thickness			
1	Soil (unconsolidated) 1/3 of soil thickne			
2	Soil (unconsolidated) 1/3 of soil thicknes			
3	Soil (unconsolidated) 1/3 of soil thickne			
4	Bedrock	25 ft		
5	Bedrock	25 ft		
6	Bedrock	37.5 ft		
7	Bedrock 37.5 ft			
8	Bedrock	75 ft		
9	Bedrock	400 ft		







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#### Going Forward Monitoring Plan Monitoring Well Network for License Termination

- Well network is derived from compilation of site observations, long-term water level monitoring, well testing, and use of flow simulations.
- Previous wells that were destroyed during demolition will be replaced and new wells installed at selected locations to monitor contaminant status.





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#### Going Forward Monitoring Plan Groundwater Monitoring Schedule for License Termination

	Sample Event	Season	Date	Month
Fall-05			Sep-05	0
			Oct-05	1
			Nov-05	2
Winter-05	<u></u>	Dec-05	3	
		Jan-06	4	
			Feb-06	5
Spring-06		Mar-06	6	
	Spring	Apr-06	7	
		May-06	8	
Summer-06		Jun-06	9	
			Jul-06	10
			Aug-06	11
Fall-06		Sep-06	12	
		Oct-06	13	
			Nov-06	14
Winter-06		Dec-06	15	
		Jan-07	16	
		Feb-07	17	
Spring-07		Mar-07	18	
	Spring	Apr-07	19	
		May-07	20	
Summer-07		· · · · · · · · · · · · · · · · · · ·	Jun-07	21
			Jul-07	22
			Aug-07	23



Going Forward Monitoring Plan Monitoring Well Installation and Initial Sampling Schedule

- Start 18-month monitoring period with Fall
   2005 sampling event.
- Sampling event to start Sept 05, complete Oct 05.
- ♦ Well installation underway.
- Sampling of new wells scheduled no less than 5 days after development.



Groundwater Recharge and Recovery from Dewatering

- Scroundwater elevations in, and out of, the dewatered areas are being measured regularly.
- Inspection of plotted groundwater elevation contours indicates that groundwater elevation has recovered to seasonal norm as of 11 Sept 05.



#### Groundwater Recharge and Recovery from Dewatering













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### Actions

# **Prior to Start of the 18 Month Groundwater Monitoring Period**



Completed Actions Related to 18 Month Monitoring Period

- Phase 2 Hydrogeologic Work Plan scope supporting the on site groundwater monitoring is complete
- Capture Zone Study is complete
- New monitoring well locations identified
- New monitoring wells are being installed
- ♦ The PAB, RHR area has recharged
- Groundwater Suppression secured including the Containment Mat sump



# Additional Actions Prior to start of 18 Month Monitoring Period

- Complete the remediation of the bedrock under the Tank Farm
- Complete the rad assessment of the areas affected by the remediation of bedrock
- Sackfill Tank Farm area (Southeast PAB Excavation)
- Complete monitoring well installation
- 5 day waiting period before sampling following monitoring well development
- Conduct the September groundwater sampling event

