Groundwater Monitoring and Relevance to LTP Compliance

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"

$$25mr/yr \geq D_{Total} = D_{Soil} + D_{ExistingGW} + D_{FutureGW}$$

REMOVE · RESTORE · REUSE
CY DECOMMISSIONING PROJECT

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

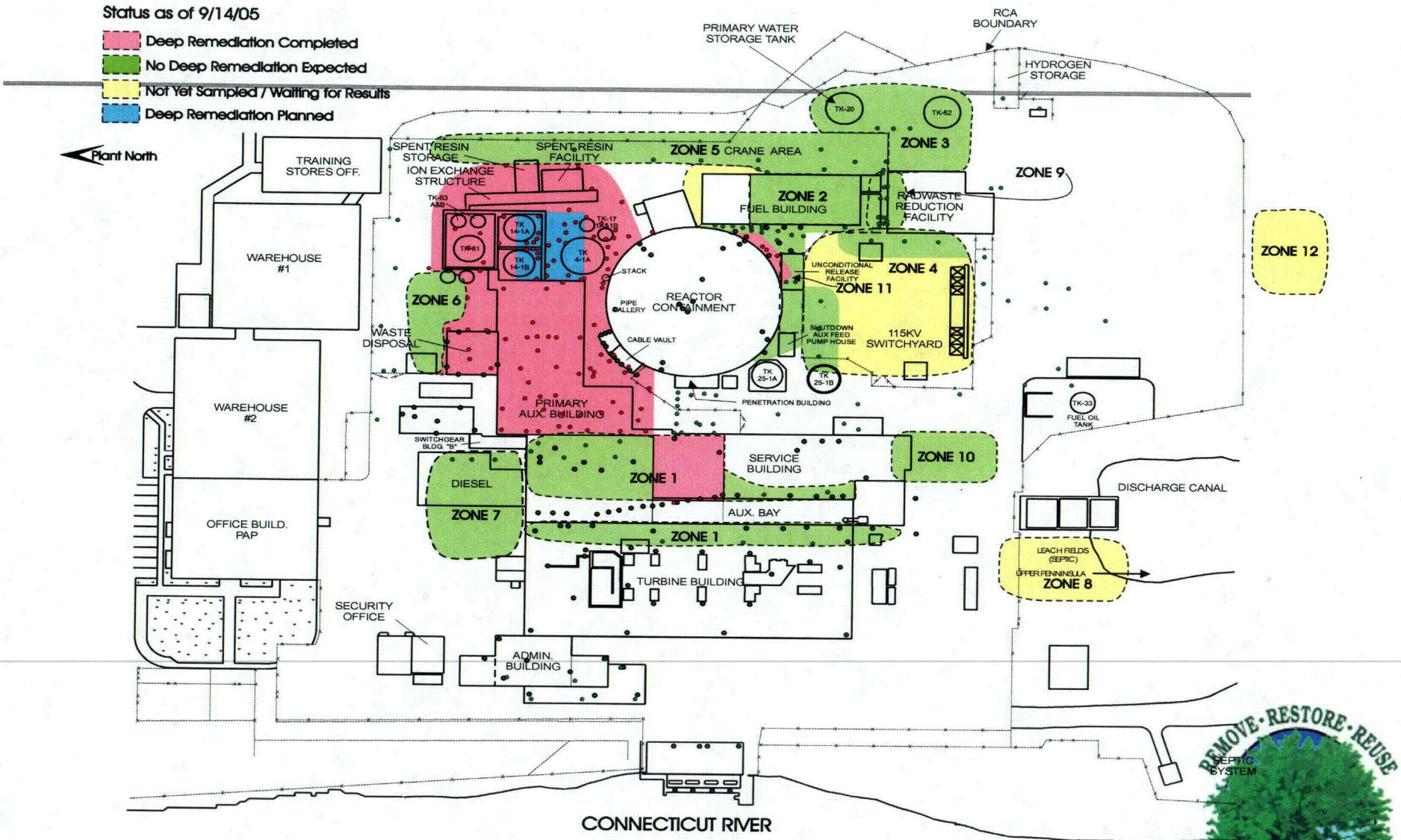
LTP Compliance Criteria
Determination of Existing Groundwater Dose

- 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

Rad Remediation Below Groundwater Table



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Soil Characterization Results
Summary of Soil Sample Results

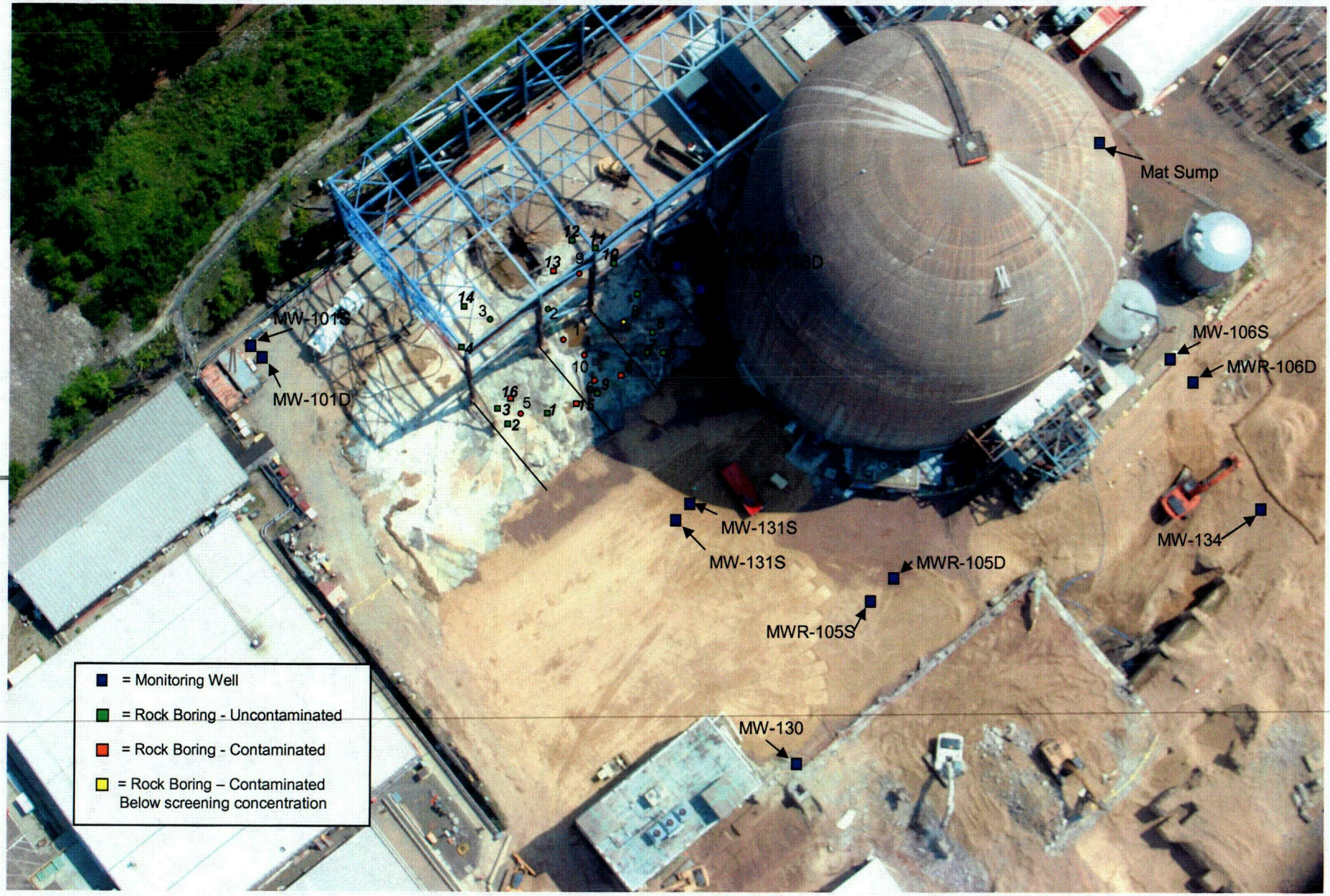
- Extensive subsurface soil sampling program conducted since 1997
- All suspect areas sampled to bedrock or 24+ feet below grade
- Few low potential areas remain to be sampled and results evaluated
- Only remediation below normal water table remaining is bedrock in Tank Farm area
- Bedrock remediation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


Mat Sump
MW-101S
MW-101D
MW-106S
MWR-106D
MW-131S
MW-131S
MW-134
MWR-105D
MWR-105S
MW-130
= Monitoring Well
= Rock Boring - Uncontaminated
= Rock Boring - Contaminated
= Rock Boring – Contaminated
Below screening concentration

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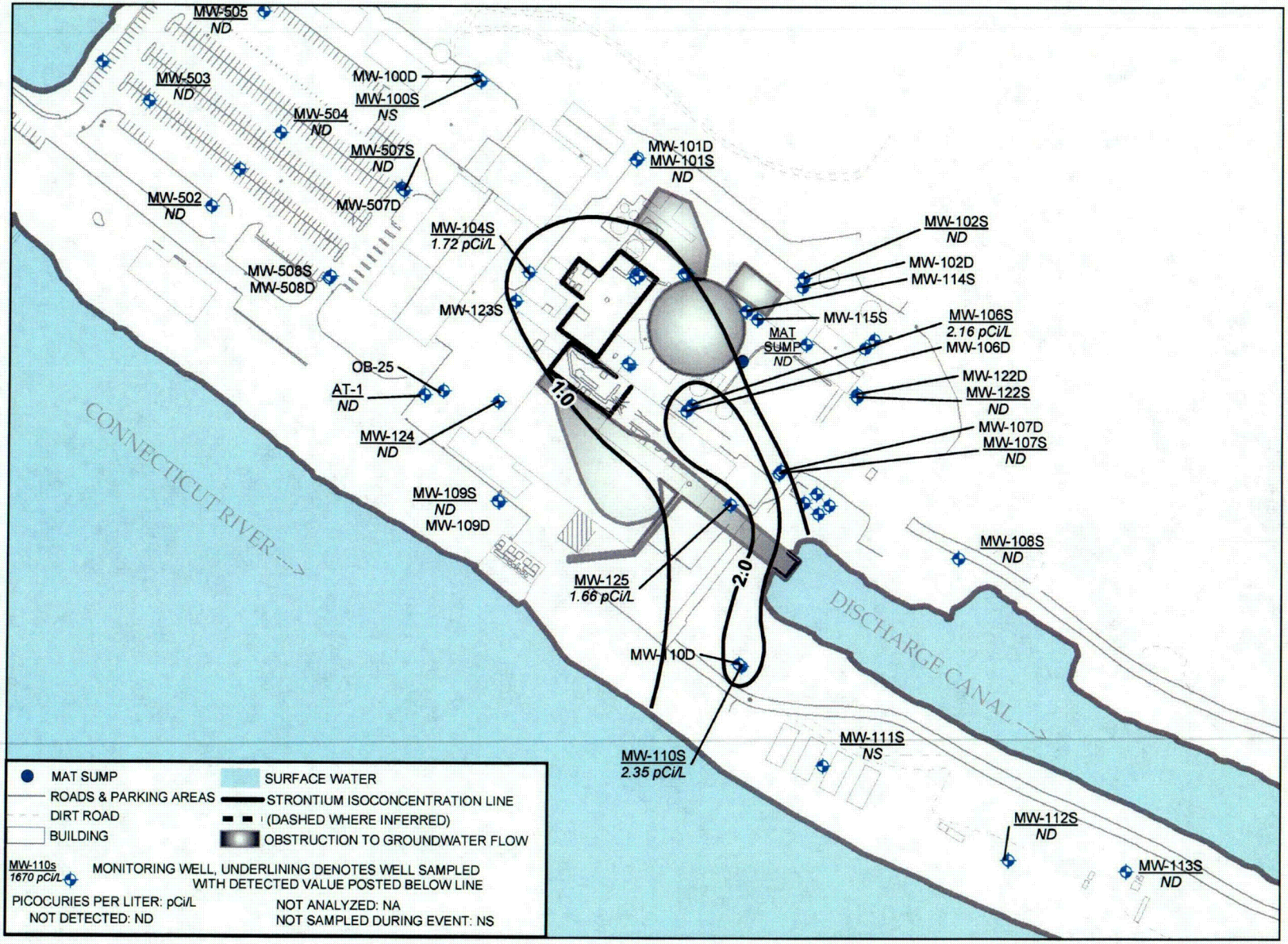
Groundwater Monitoring Results

- 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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\\boomer\H\projects3\CT_Yankee\MXD\GW_Q2_05\Sr-90_UNCONFINED_06_05.mxd JKelly 9/1/2005

FIGURE 6-17
INFERRED DISTRIBUTION OF STRONTIUM-90 (pCi/L) IN THE UNCONFINED AQUIFER
AT THE INDUSTRIAL AREA AND UPPER PENINSULA AREA OF THE HADDAM NECK PLANT JUNE 2005
HADDAM NECK, CT

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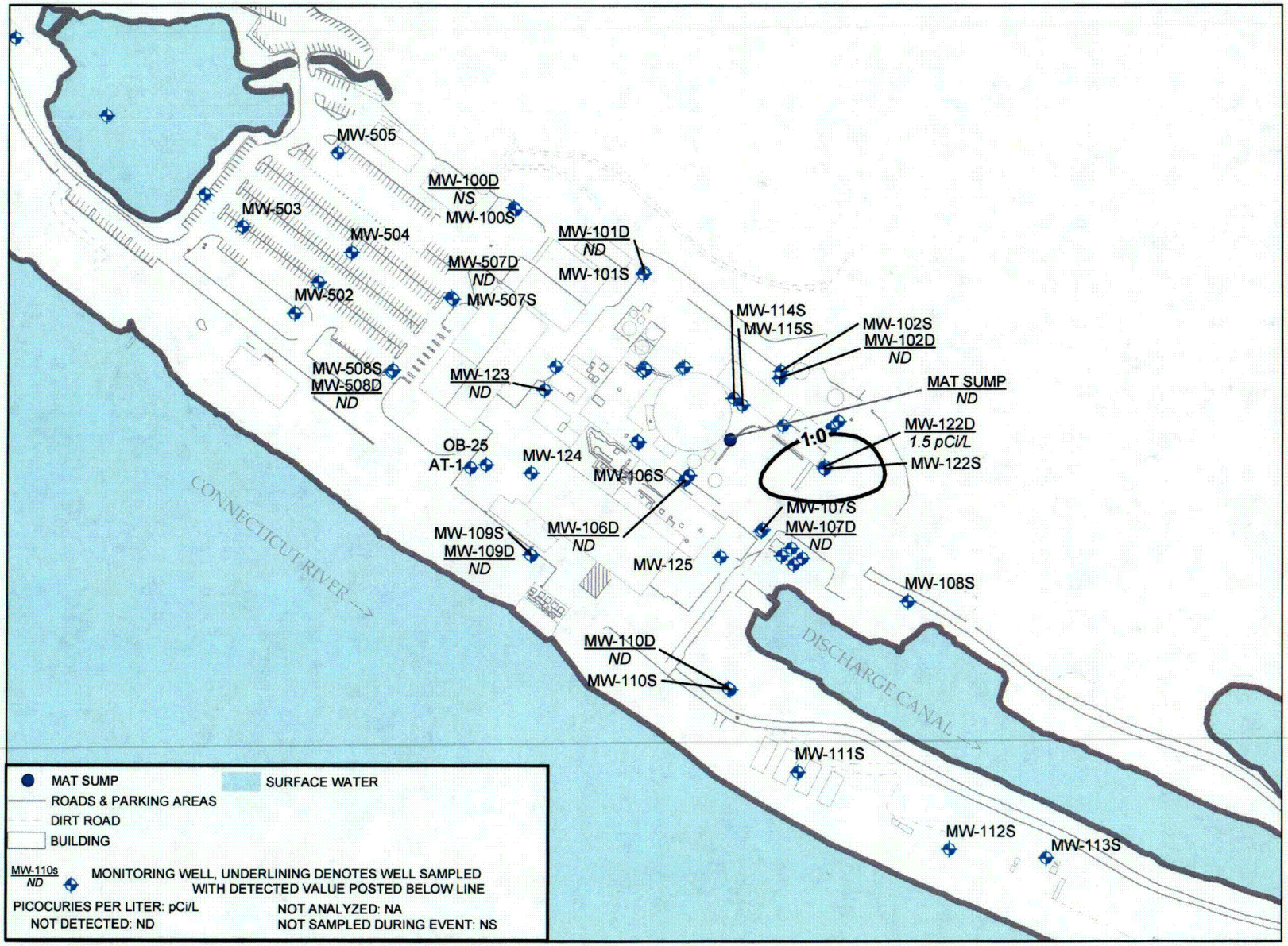

FIGURE 6-18
INFERRED DISTRIBUTION OF STRONTIUM-90 (pCi/L) IN THE CONFINED AQUIFER
AT THE INDUSTRIAL AREA AND UPPER PENINSULA AREA OF THE HADDAM NECK PLANT JUNE 2005
HADDAM NECK, CT

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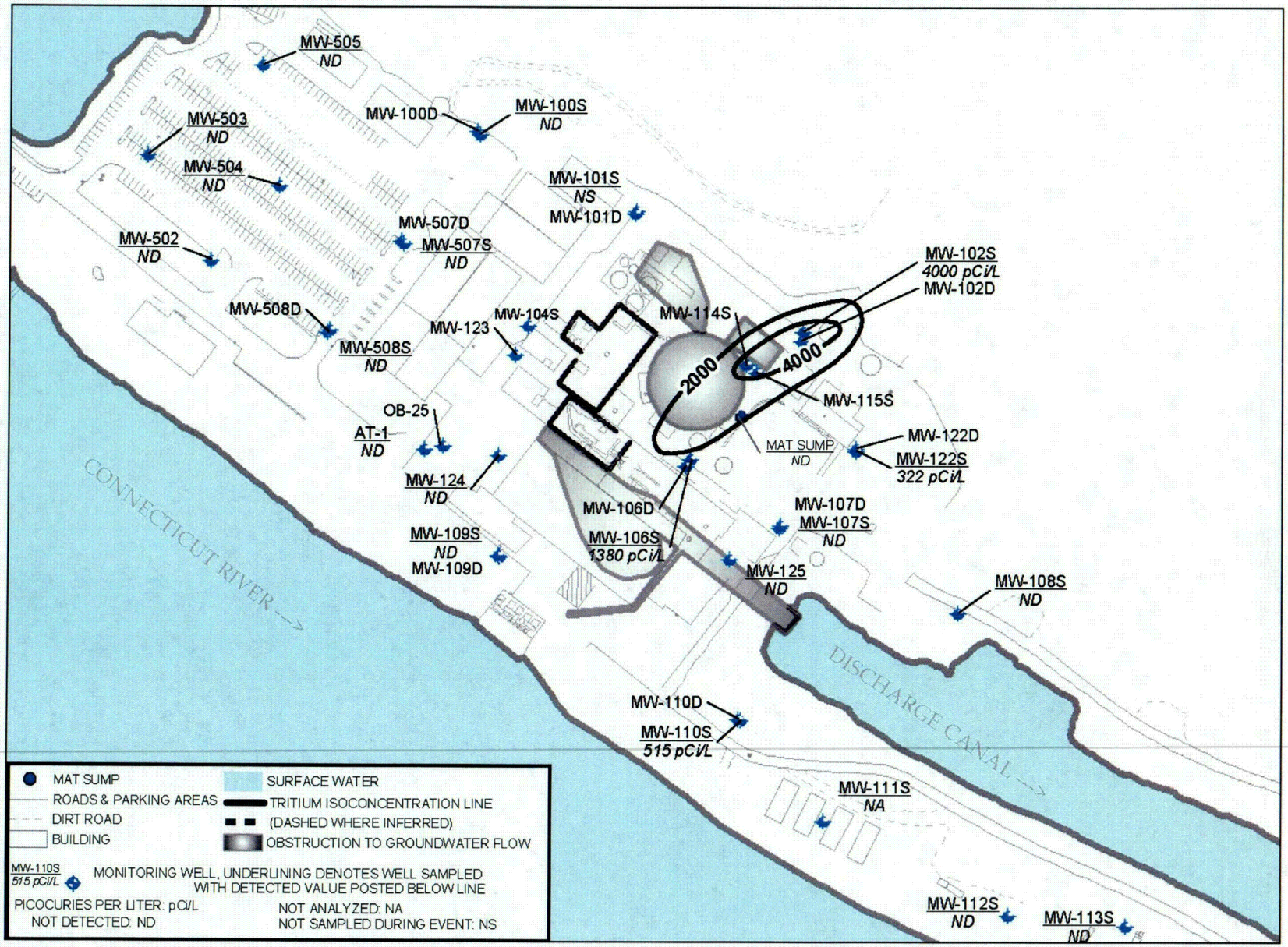

FIGURE 6-15
INFERRED DISTRIBUTION OF TRITIUM (pCi/L) IN THE UNCONFINED AQUIFER
AT THE INDUSTRIAL AREA AND UPPER PENINSULA AREA OF THE HADDAM NECK PLANT JUNE 2005
HADDAM NECK, CT

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C05

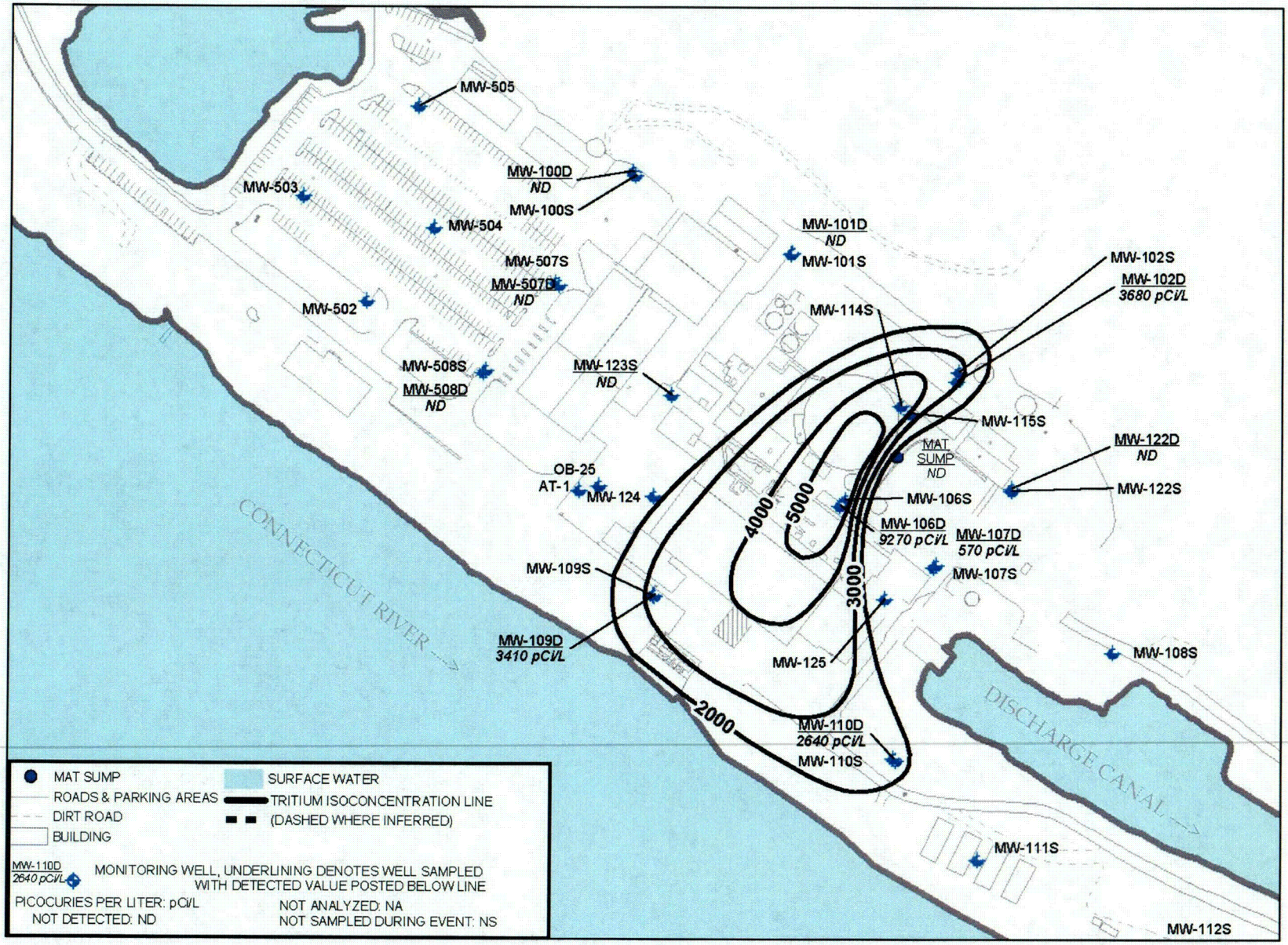

FIGURE 6-16
INFERRED DISTRIBUTION OF TRITIUM (pCi/L) IN THE CONFINED AQUIFER
AT THE INDUSTRIAL AREA AND UPPER PENINSULA AREA OF THE HADDAM NECK PLANT JUNE 2005
HADDAM NECK, CT

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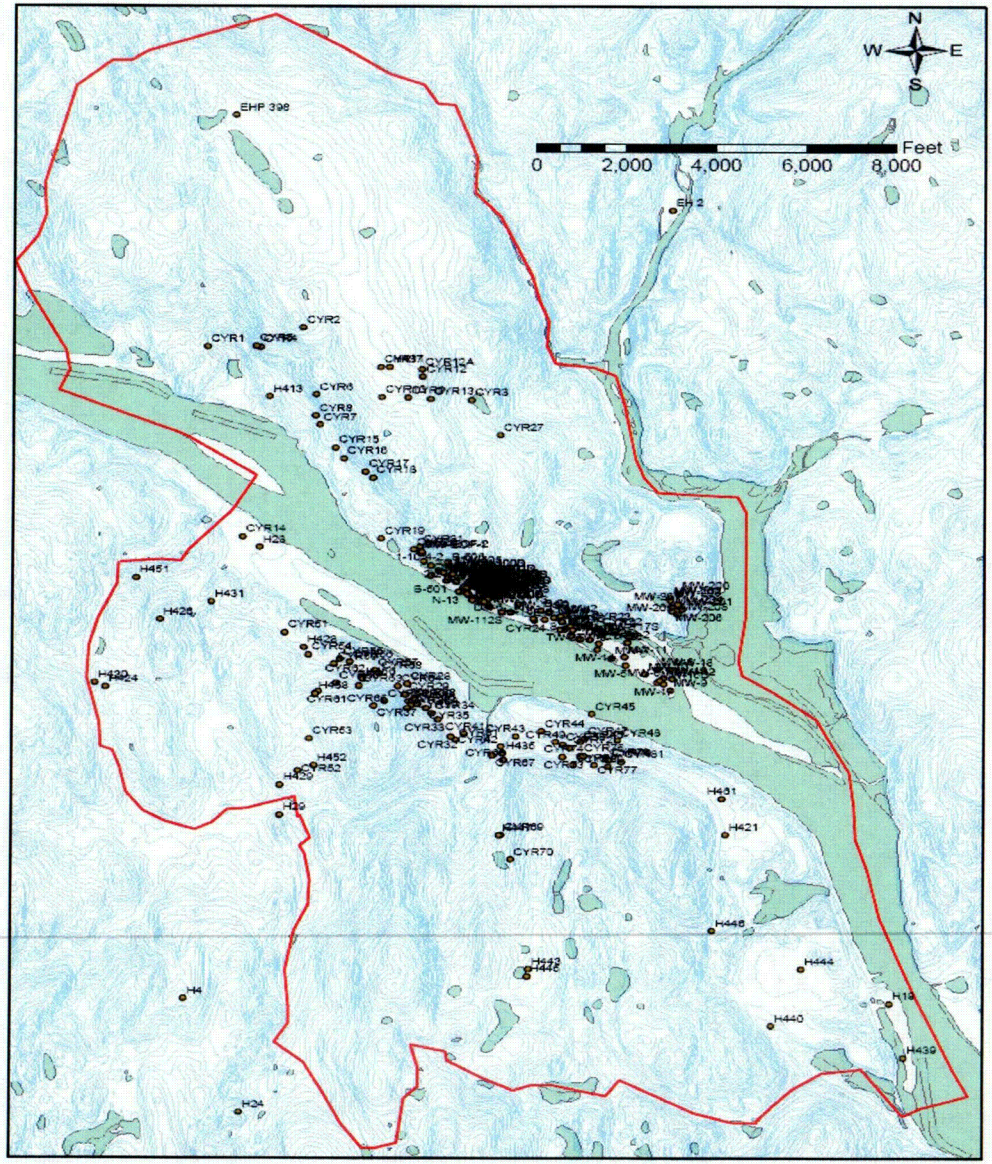
Groundwater Modeling Results

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

CY Regional Groundwater Model Geologic Data Points



Data sources:
USGS Water Resources reports
Survey of Private Wells by Connecticut Yankee staff
Wells and borings drilled on Connecticut Yankee property

Red line indicates outer boundary of active area of groundwater model

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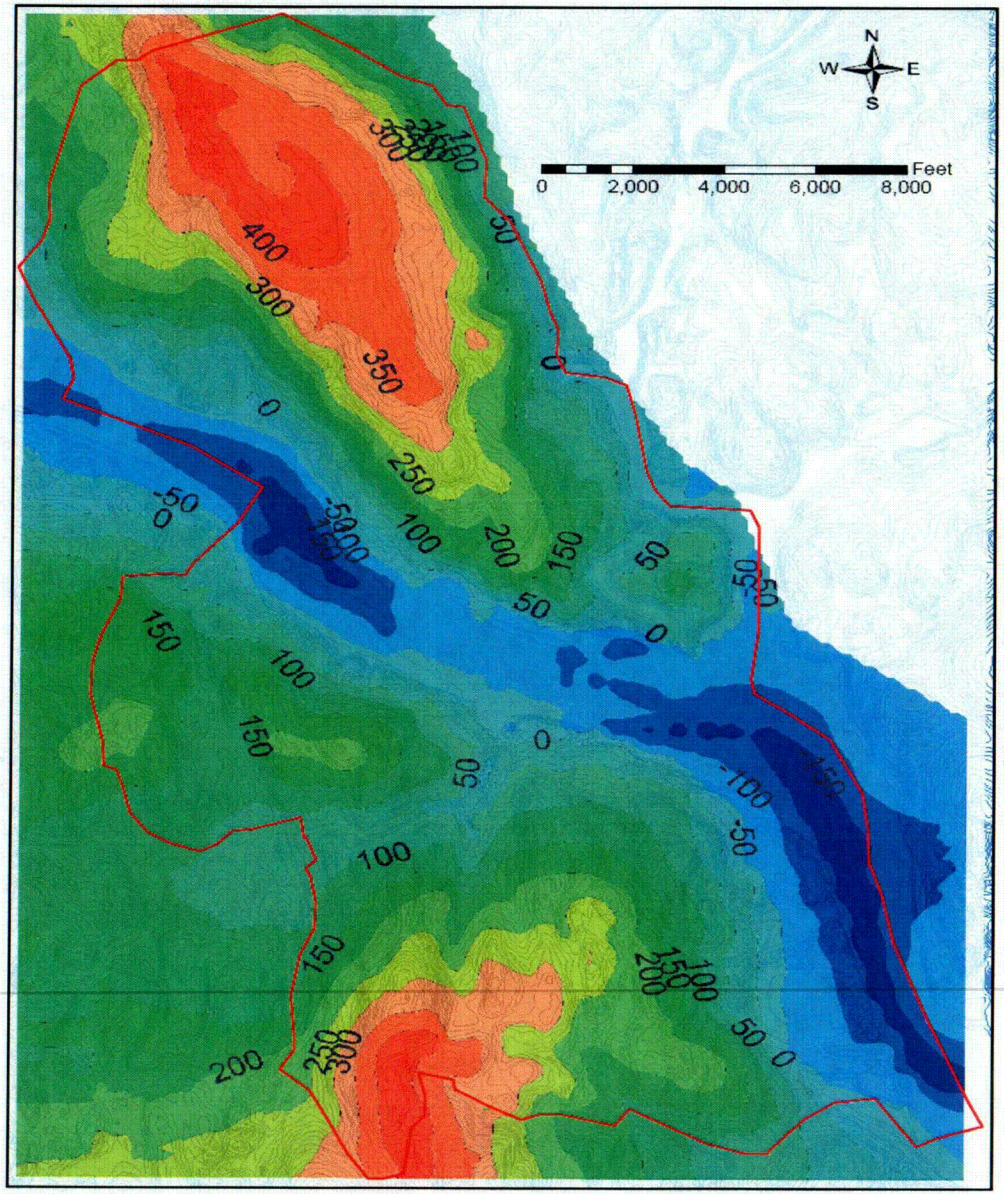
Figure 1

CY Regional Groundwater Model Top of Rock Elevation



Data sources:
Well and boring data
Surficial Geology Maps (subtract thickness from ground topo)
Soils Maps (subtract thickness from ground topo)

Red line indicates outer boundary of active area of groundwater model

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Figure 2

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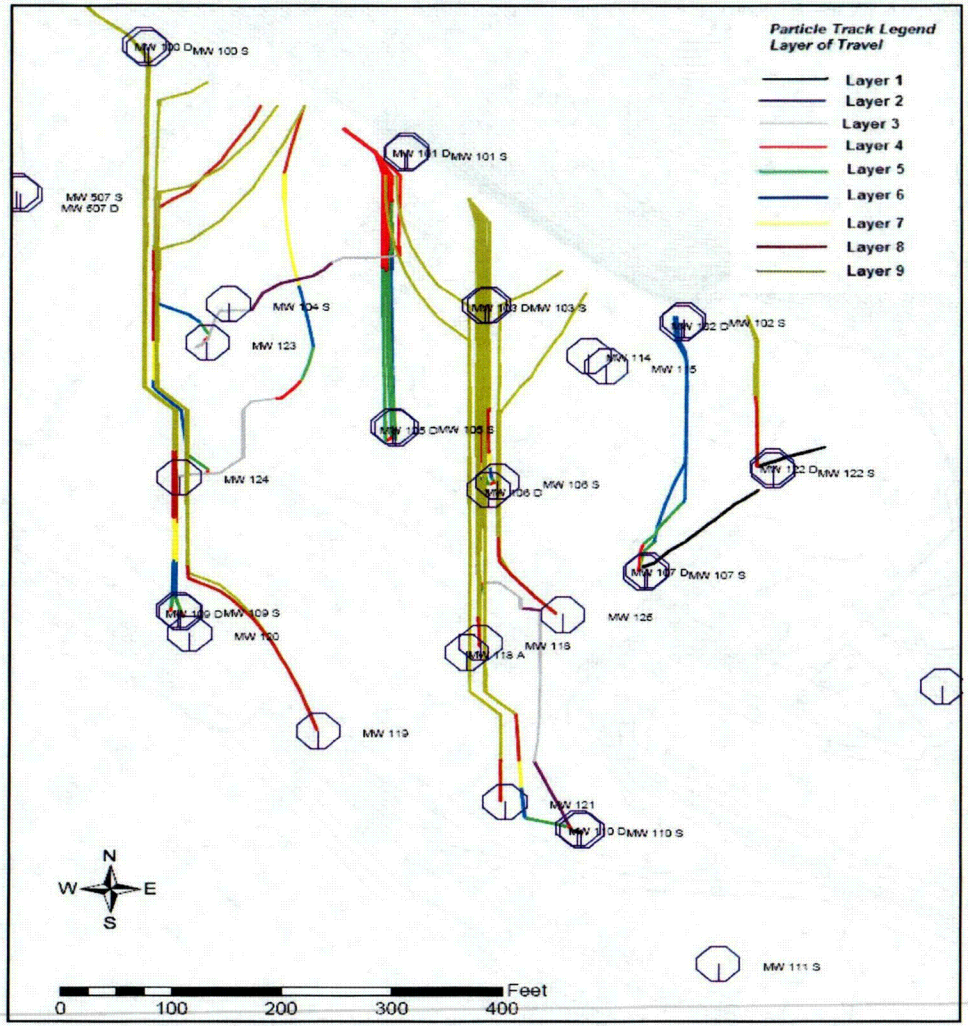
Groundwater Modeling Results – Description of Layers

Groundwater Model Layer Descriptions		
Layer Number	Stratigraphy	Thickness
1	Soil (unconsolidated)	1/3 of soil thickness
2	Soil (unconsolidated)	1/3 of soil thickness
3	Soil (unconsolidated)	1/3 of soil thickness
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

CY Groundwater Model



Legend

- Constant Head
- General Head Boundary
- Drain
- Barrier Wall

Reverse Particle Tracking from Major Monitoring Wells in Steady-state Operational Mode

Particles started at 0.1 and 0.9 times depth of layer in which each monitoring well is located

8/24/05

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Figure 35

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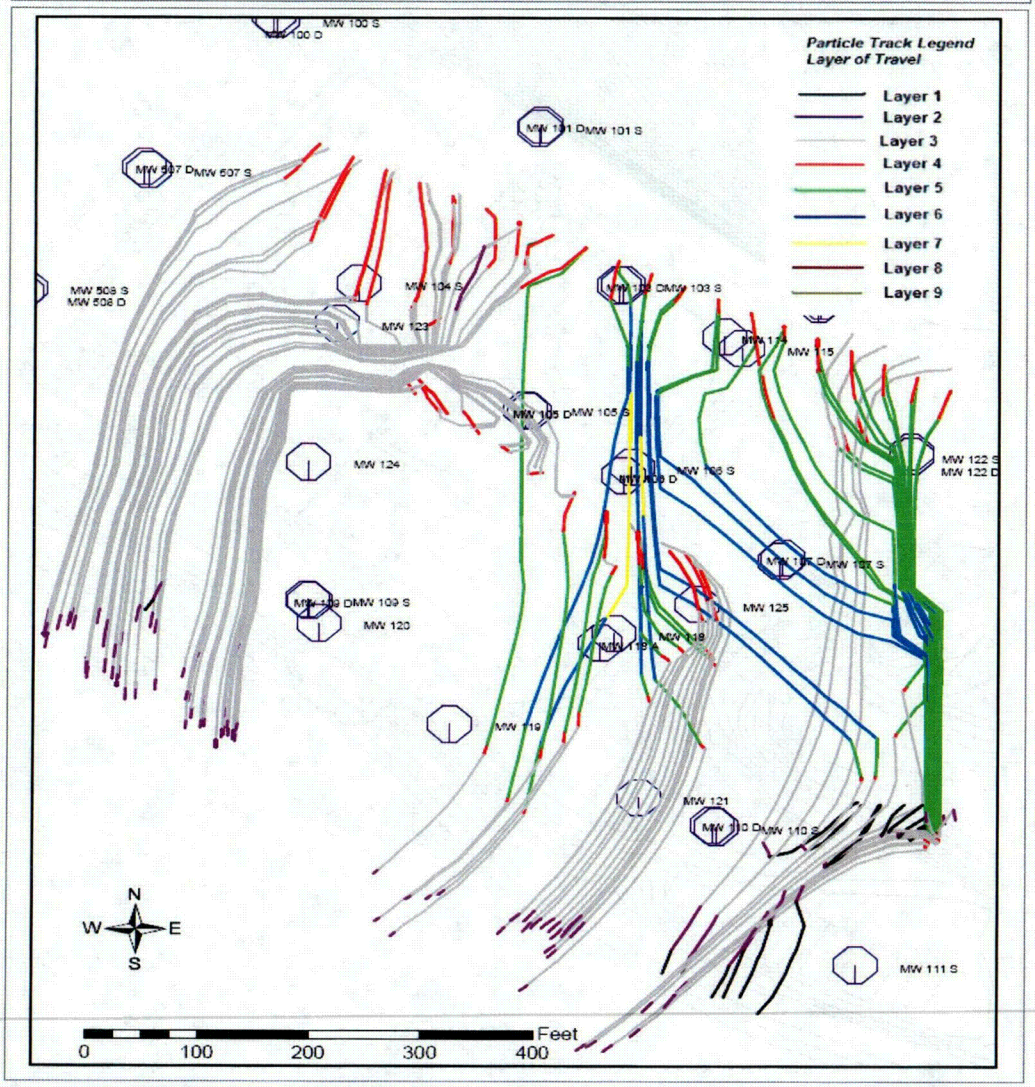
CY Groundwater Model



Legend

- Constant Head
- General Head Boundary
- Drain
- Barrier Wall

Forward Particle Tracking from two rows of arbitrary points during post demo conditions under average annual recharge

Particles started at 0.1 and 0.9 times depth of layer. Particles were started in model layers 3 and 4

8/24/05

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Figure 45

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.


MW-102D
MW-102S
MW-122S
MWR-122D
MW-110S
MW-117
MW-AT-5
MW-112
MW-132S
MW-132D
MW-113
MWR-103S
MWR-103D
MW-107S
MW-107D
MW-101S
MW-101D
MW-106S
MWR-106D
MW-125
MW-121A
MW-131S
MW-131D
MWR-105S
MWR-105D
MW-134
MW-110D
MW-118A
MW-100D
MW-100S
MW-130
MW-135
MW-123
MW-133
MW-124
MW-120
MW-109D
MW-109S
MW-AT-1
MW-508S
MW-508D
= Single Completion Well
= Multi-Level Well

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Going Forward Monitoring Plan
Groundwater Monitoring Schedule for License Termination

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

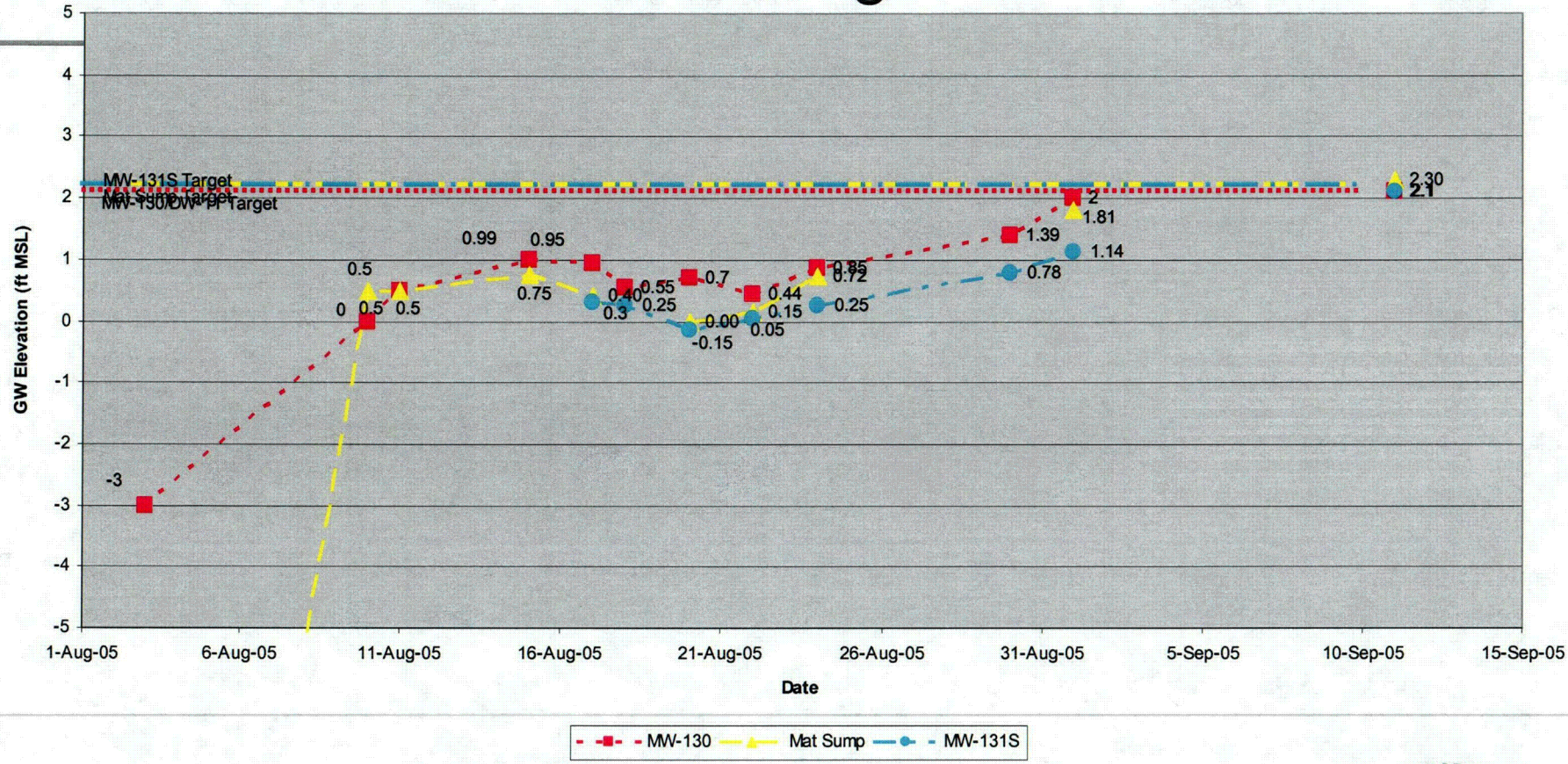
Going Forward Monitoring Plan
Monitoring Well Installation and Initial Sampling Schedule

- 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

- Groundwater 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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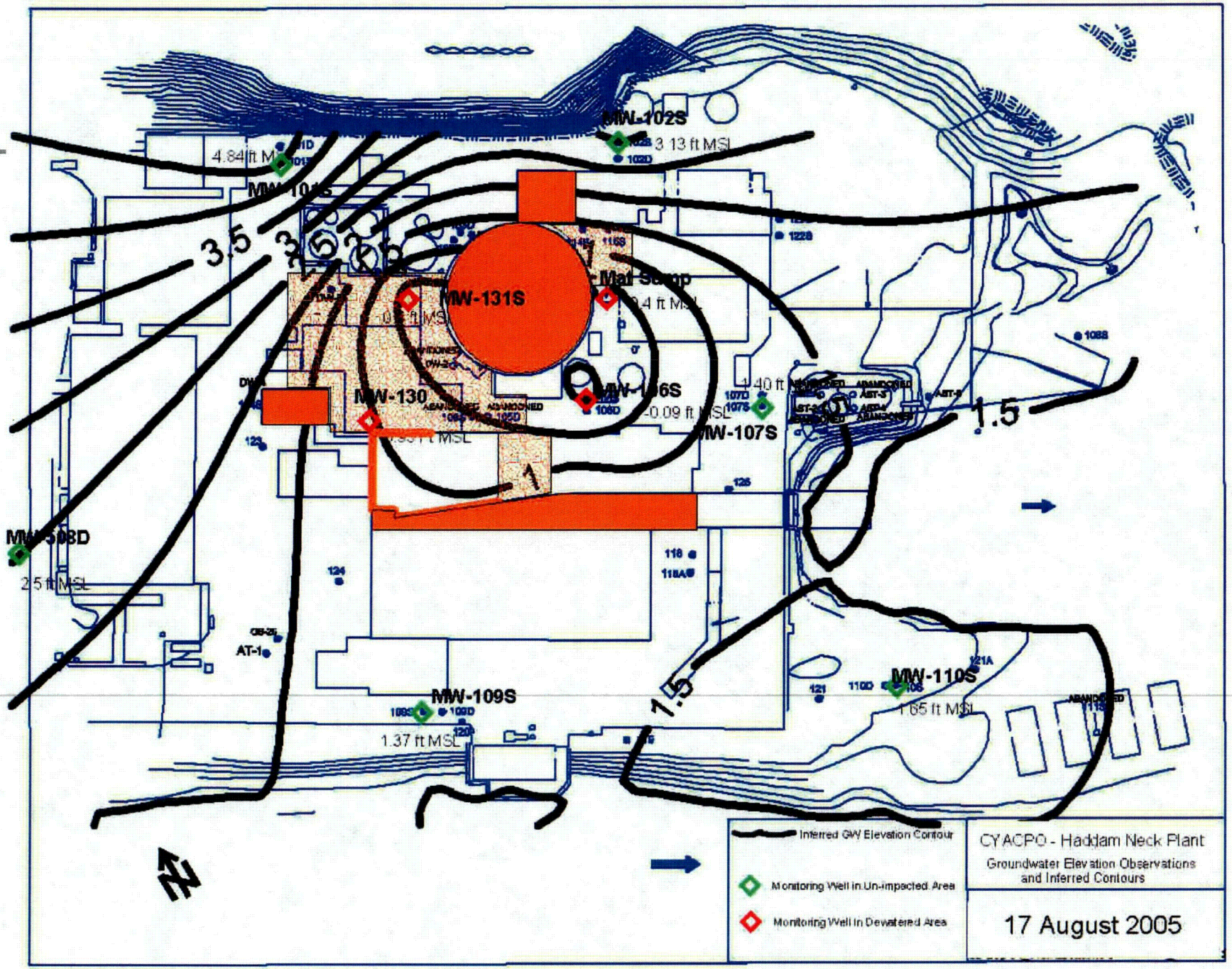
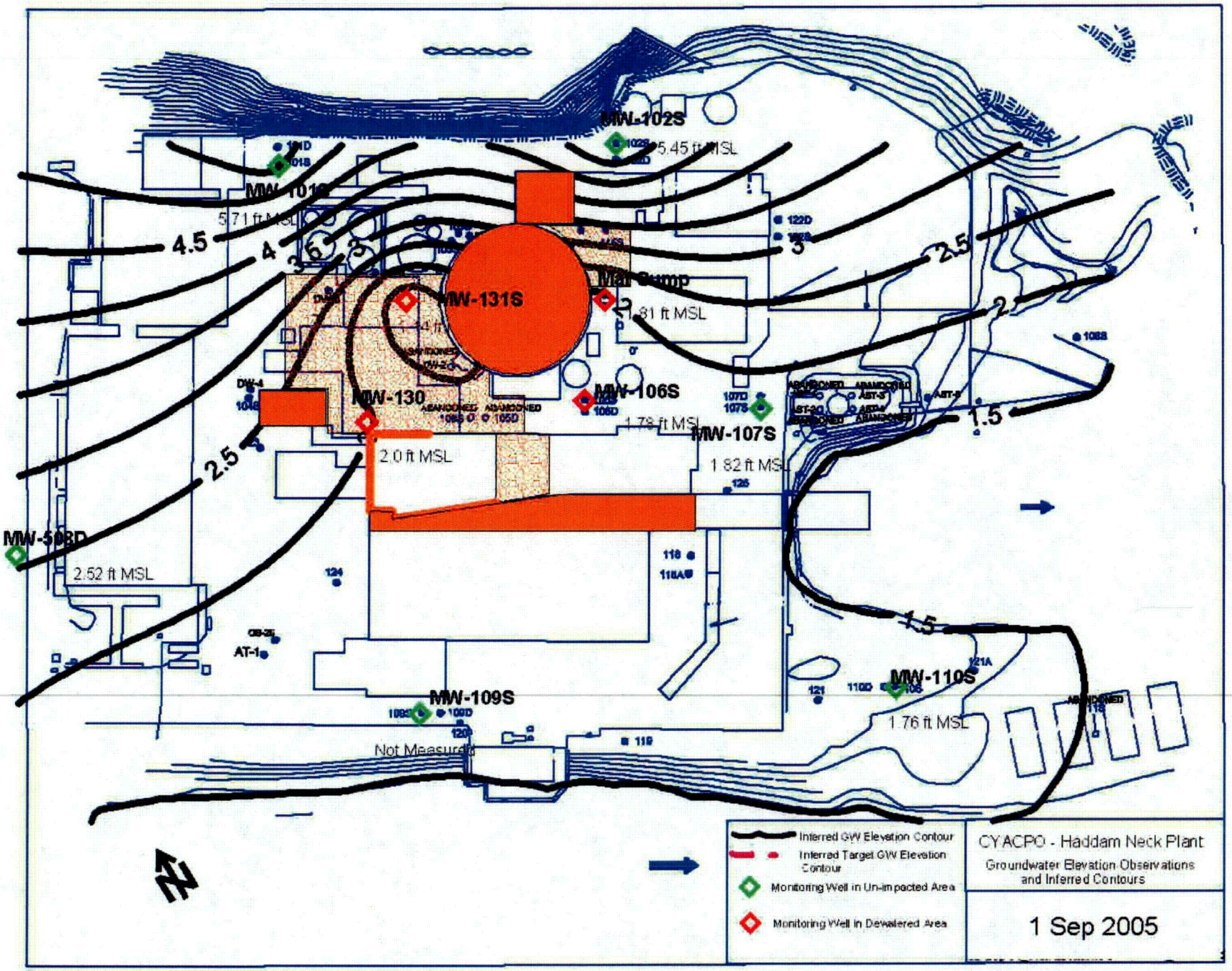
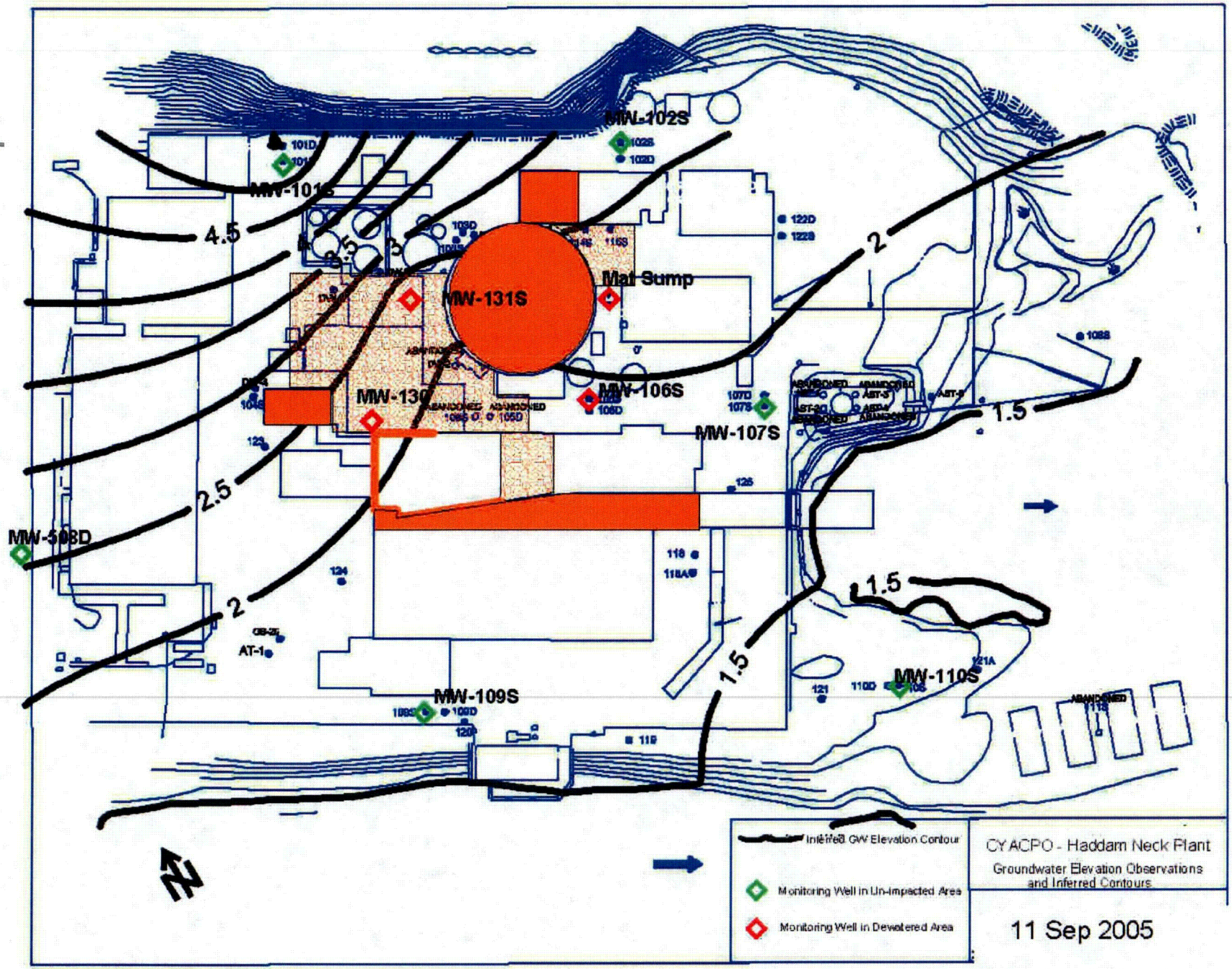

MW-102S
3.13 ft MSL
4.84 ft M
MW-131S
MW-130
MW-106S
-0.09 ft MSL
MW-107S
1.40 ft
MW-108D
2.5 ft MSL
MW-109S
1.37 ft MSL
MW-110S
1.65 ft MSL
3.5
3.5
3.5
1.5
1.5
1
1
AT-1
Inferred GW Elevation Contour
Monitoring Well in Un-impacted Area
Monitoring Well in Dewatered Area
CYACPO - Haddam Neck Plant
Groundwater Elevation Observations and Inferred Contours
17 August 2005

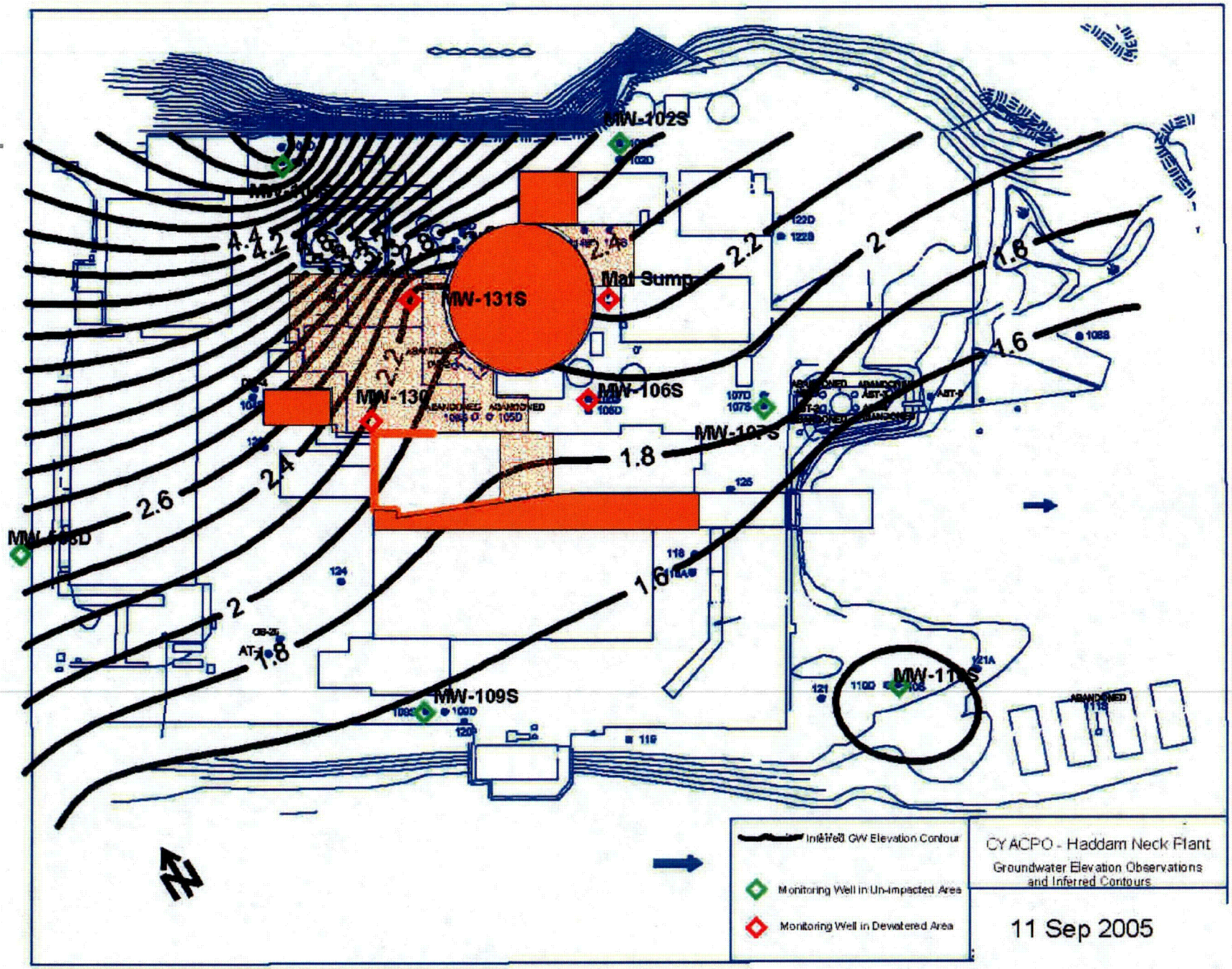
C13


MW-102S
5.45 ft MSL
MW-101S
5.71 ft MSL
4.5
4
3.5
3
2.5
2
1.5
Mar Sump
1.81 ft MSL
MW-131S
MW-130
2.0 ft MSL
MW-106S
1.78 ft MSL
MW-107S
1.82 ft MSL
MW-108D
2.52 ft MSL
MW-109S
Not Measured
MW-110S
1.76 ft MSL
Inferred GW Elevation Contour
Inferred Target GW Elevation Contour
Monitoring Well in Un-impacted Area
Monitoring Well in Dewatered Area
CY ACPO - Haddam Neck Plant
Groundwater Elevation Observations and Inferred Contours
1 Sep 2005

C14


MW-102S
MW-101S
MW-131S
Mat Sump
MW-130
MW-106S
MW-107S
MW-108D
MW-109S
MW-110S
4.5
3.5
3
2
2.5
1.5
1.5
1.5
Inferred GW Elevation Contour
Monitoring Well in Un-Impacted Area
Monitoring Well in Dewatered Area
CY ACPO - Haddam Neck Plant
Groundwater Elevation Observations and Inferred Contours
11 Sep 2005

C15


MW-102S
MW-131S
Mat Sump
MW-130
MW-106S
MW-107S
MW-109S
MW-110S
4.4
4.2
3.8
3.6
2.8
2.6
2.4
2.2
2
1.8
1.6
Inferred GW Elevation Contour
Monitoring Well in Un-Impacted Area
Monitoring Well in Dewatered Area
CY ACPO - Haddam Neck Plant
Groundwater Elevation Observations and Inferred Contours
11 Sep 2005

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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
- Backfill 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