

# **2009 Inspection and Annual Site Status Report for the Site A/Plot M, Cook County, Illinois Decontamination and Decommissioning Program Site**

## **Summary**

Site A/Plot M was inspected on April 28, 2009. The site, located within a county forest preserve with significant tree and grass cover, is in good condition. No cause for a follow-up inspection was identified.

Argonne National Laboratory (ANL) plugged and abandoned 28 monitor wells since the 2008 inspection and labeled the outer protective casing of the remaining wells with their unique identification number. With the exception of one well (Well 11A) all of the monitoring wells visited during the inspection were locked and secured.

A couple of holes in the ground surface of Site A were identified during the inspection. It is recommended that ANL fill in these holes with topsoil. The holes appear to be associated with sanitary/sewer lines that were abandoned in place.

Erosion along footpaths on top of Plot M remains in need of repair. ANL is in the process of obtaining a contractor to conduct the erosion repair work.

Tritium and strontium-90 contamination remains in groundwater, and tritium remains in surface water, with concentrations generally on a downward trend consistent with previous results.

## **1.0 Introduction**

This report presents the findings of the 2009 annual U.S. Department of Energy (DOE) Office of Legacy Management (LM) inspection of Site A/Plot M at the Palos Forest Preserve in Cook County, Illinois, and environmental monitoring results from 2008. Features and photograph locations (PLs) discussed in this report are shown on the attached figure.

The following points describe the site:

1. Site A is approximately 19 acres in size. It contains two buried nuclear reactor shells and buried debris from the various support buildings associated with the reactors and other laboratory operations. Operations commenced in 1943 and decommissioning was complete by 1956. The only structures visible are the stone monument marking the site, occasional concrete flatwork and fence post collars, a section of the original chain link fence, and monitor wells. The site surface, which had been cleared and used as a golf course before World War II, is returning to hardwood forest. Groundwater in the glacial drift beneath Site A is being monitored for hydrogen-3 (tritium) and strontium-90 via 6 monitor wells (BH41, BH51, BH52, BH54, BH55, and BH56).
2. Plot M is less than 1 acre in size and contains a series of trenches that were used to bury radioactive wastes. A granite monument and six boundary monuments mark the site, which

consists of a mounded earth cover planted in grass, placed over an inverted concrete box. The concrete box was constructed in 1956. It is intended to reduce infiltration and lateral movement of soluble contaminants. Groundwater in the glacial drift beneath Plot M is monitored for hydrogen-3 (tritium) and strontium-90 via 9 monitor wells (BH2, BH3, BH4, BH6, BH9, BH10, BH11S, BH26, and BH35). Groundwater in the dolomite bedrock wells north of Plot M is monitored for hydrogen-3 (tritium) via 10 monitor wells (DH3, DH4, DH9, DH10, DH11, DH12, DH13, DH14, DH15, and DH17). Tritium contamination in groundwater beneath Plot M is thought to result from a single period of release before the concrete containment was installed.

3. DOE–LM contracts directly with ANL for all environmental sampling, analysis, and reporting. Environmental monitoring reports are issued annually by ANL.
4. In 2003 and 2004, DOE and S.M. Stoller staff from the DOE office in Grand Junction, Colorado, worked with representatives of the DOE Chicago Operations Office, ANL, and the Illinois Emergency Management Agency (IEMA) to evaluate groundwater and surface water conditions and the current monitoring program. The evaluation demonstrated that contaminant levels are diminishing, and the lateral and vertical extent of contamination has not increased. The monitoring program was revised, as described in the *Environmental Monitoring Program at Site A and Plot M, Palos Forest Preserve, Cook County, Illinois* (GJO-2004-558-TAC, February 2004).
5. The *Long-Term Surveillance and Maintenance Plan for Site A and Plot M, Palos Forest Preserve, Cook County, Illinois*, (DOE–LM/GJ704–2004, December 2004) incorporates the modified monitoring program.
6. In 2005, DOE–LM incorporated monitoring data from the ANL database into the DOE–LM database. The monitoring results are available on the DOE–LM public website at <http://www.lm.doe.gov/land/sites/il/sitea/sitea.htm>.

## 2.0 Inspection Results

M. Miller (Chief Inspector) and K. Broberg (Assistant Inspectors) both with S.M. Stoller Corporation, the Legacy Management (LM) contractor, conducted the inspection on April 28, 2009. Inspection participants included:

- A. Kleinrath, DOE–LM
- B. Quirke, DOE–Chicago Operations Office
- N. Golchert, Argonne National Lab (ANL)
- A. Fracaro, Argonne National Lab (ANL)
- L. Haskell, Illinois Emergency Management Agency (IEMA)

It should be noted that IEMA does not have regulatory authority over DOE at Site A/Plot M but is informed of and consulted with on long-term surveillance and maintenance activities that DOE conducts at Site A/Plot M.

The inspection was conducted in accordance with the *Long-Term Surveillance and Maintenance Plan for Site A and Plot M, Palos Forest Preserve, Cook County, Illinois*, issued in December 2004. The purposes of the inspection were to look for evidence that the integrity of the disposal site is not threatened, to evaluate the condition of the monuments, to determine if maintenance is needed, and to examine the condition of DOE monitor wells.

Inspectors met at the Red Gate Woods parking area and reviewed the Plan of the Day and the Job Safety Analysis. Inspectors noted that the pump handles remained off the picnic wells and that a portable restroom was in place. The handles were removed from the pump to prevent exposure to tritium detected in the dolomite aquifer, as well as fecal coliform detected in the groundwater. The fecal coliform originated from a nearby permanent restroom facility, which was removed and replaced with the observed portable restroom.

Pre-inspection discussions between personnel from the DOE-Chicago Operations Office, DOE-LM, and ANL indicate that both DOE-Chicago Operations and ANL have records that need be transferred to DOE-LM. ***It is recommended that DOE-LM work with DOE-Chicago Operations Office and ANL to facilitate the transfer of the records.***

#### Site A

Inspectors drove to Site A, walked to the center of the area, and examined the historical monument (PL-1) and monitor wells. The Site A historical monument is in good shape.

Inspectors walked Site A, inspecting monitor wells and observing the general condition of the site. All monitor wells observed at Site A were secured with locks and identified with a well number on the outer casing (PL-2). No monitor wells were opened during the inspection. ANL personnel visit the wells quarterly for sampling, ensure well security, and perform required maintenance at that time.

Inspectors identified two holes in the ground at Site A that appear to be associated with sanitary/sewer lines that were abandoned in place (PL-3 and PL-4). ***It is recommended that ANL fill in the holes with topsoil.***

A large drop off is present on the access road leading to Site A at the point where the old asphalt connects with the dirt road. The drop off is present toward one side of the road, so the road remains passable at this time. ***It is recommended that ANL work with the Palos Forest Preserve District to repair the drop off on the Site A access road.***

Vegetation growth along the lower portion of the access road to Site A (near the Archer Avenue turn-off) is an on-going issue. ANL is doing a good job working with the Palos Forest Preserve District to maintain control of the encroaching vegetation. ***It is recommended that ANL continue to work with the forest preserve to keep the road passable from encroaching vegetation.***

#### Plot M

Inspectors drove from Site A to an area leading back to Plot M, and then walked back to Plot M. The Plot-M historic marker was in good condition, with the exception of some minor vandalism that was reported in previous inspections. Some words on the marker are chiseled off (PL-5). All of the corner markers were located and found to be in good shape (PL-6).

Erosion along the footpaths that cross over the top of Plot M (and identified in previous inspections) has not been repaired (PL-7). Efforts by ANL to secure a subcontractor to repair the erosion are underway now that all of the monitoring wells that needed to be abandoned at Plot M were taken care of in 2008.

The protective casings of the monitor wells at Plot M were clearly identified with well numbers (PL-8 and PL-9). All monitor wells at Plot M, with the exception of Well 11-A (PL-10) were locked and secured. *It is recommended that ANL install a lock on Well 11-A as soon as possible.*

### 3.0 Monitoring Results

ANL collects water samples quarterly in accordance with the *Environmental Monitoring Program at Site A and Plot M, Palos Forest Preserve, Cook County, Illinois*. All samples are analyzed for tritium. Samples from monitoring locations near historic occurrences of strontium-90 are analyzed for that radionuclide, as well. Monitoring results are compiled in *Surveillance of Site A and Plot M, Report for 2008* (ANL-08/04, April 2008) which will be available to the public on the LM website. Monitoring results for 2008 are summarized below.

ANL plugged and abandoned the following 28 monitor wells since the 2008 inspection.

BH5	BH8	BH11C	BH20	BH21
BH24	BH25	BH28A	BH28B	BH29A
BH30A	BH30B	BH33	BH34	BH37
BH42	BH44	BH45	BH46	BH47
BH48	BH49	BH50	BH53	DH1
DH2	DH5	DH18		

#### 3.1. Surface Water

An intermittent stream flows past Plot M and a seep issues from the stream bank adjacent to the historic burial area.

Tritium levels exceeded the State of Illinois standard of 20 nanocuries per liter (nCi/L), or 20,000 picocuries per liter (pCi/L) at the seep (Location 0006) and decreased downstream. Seep activities ranged from 5.5 to 112.5 nCi/L (Figure 1).

Quarterly surface water samples collected from five area ponds in 2008 (NW Site A, SE Site A, Bull Frog Lake, Horse Collar Slough, and Tomahawk Slough) ranged from non detect (< 0.1 nCi/L) to 0.14 nCi/L.

**Site A/Plot M Decommissioned Reactor (SAM01)  
Tritium Concentration, Plot M, Surface Water**

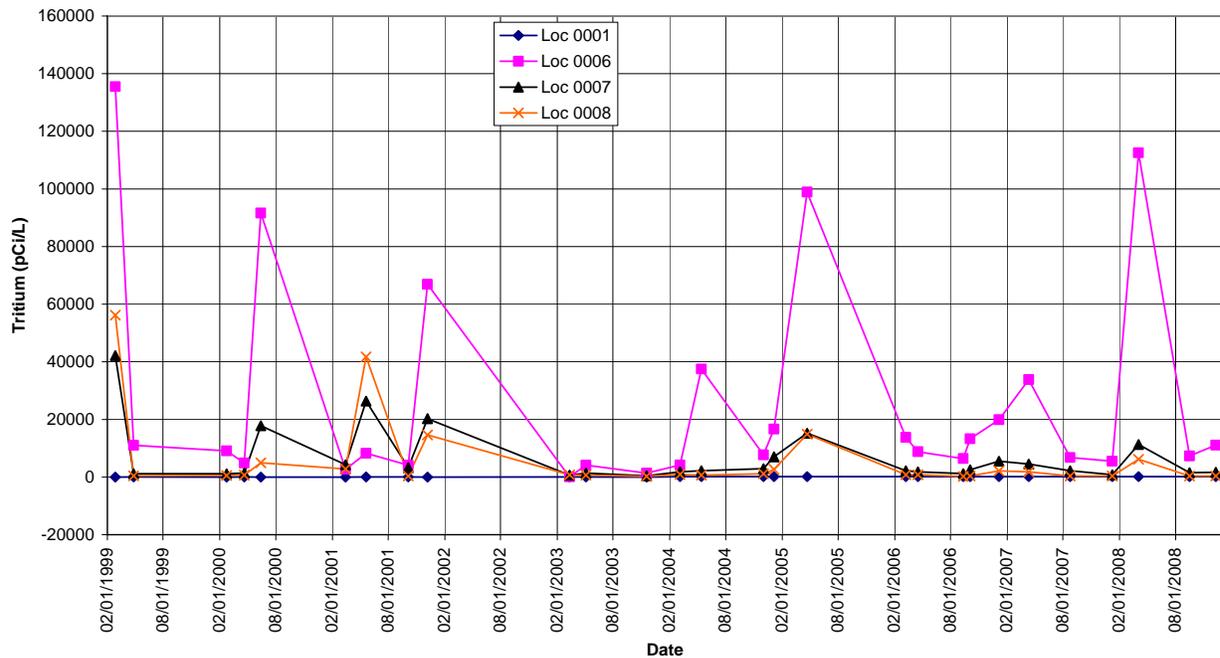


Figure 1. Tritium Activities in Surface Water at Site A/Plot M, Cook County, Illinois

### 3.2. Groundwater—Glacial Drift

In 2008, tritium was detected in the groundwater at all six Site A monitor well locations completed in the glacial drift. None exceeded the standard of 20 nCi/L. Activities continue to decrease and ranged from non-detect (less than 0.1 nCi/L) to 2.9 nCi/L (Figure 2).

In 2008, strontium-90 was detected in groundwater at three of six Site A monitor well locations. Activities ranged from non-detect (less than 0.25 pCi/L) to 2.57 pCi/L, but none exceeded the State of Illinois standard of 8 pCi/L (Figure 3).

**Site A/Plot M Decommissioned Reactor (SAM01)  
Tritium Concentration, Site A, Glacial Drift**

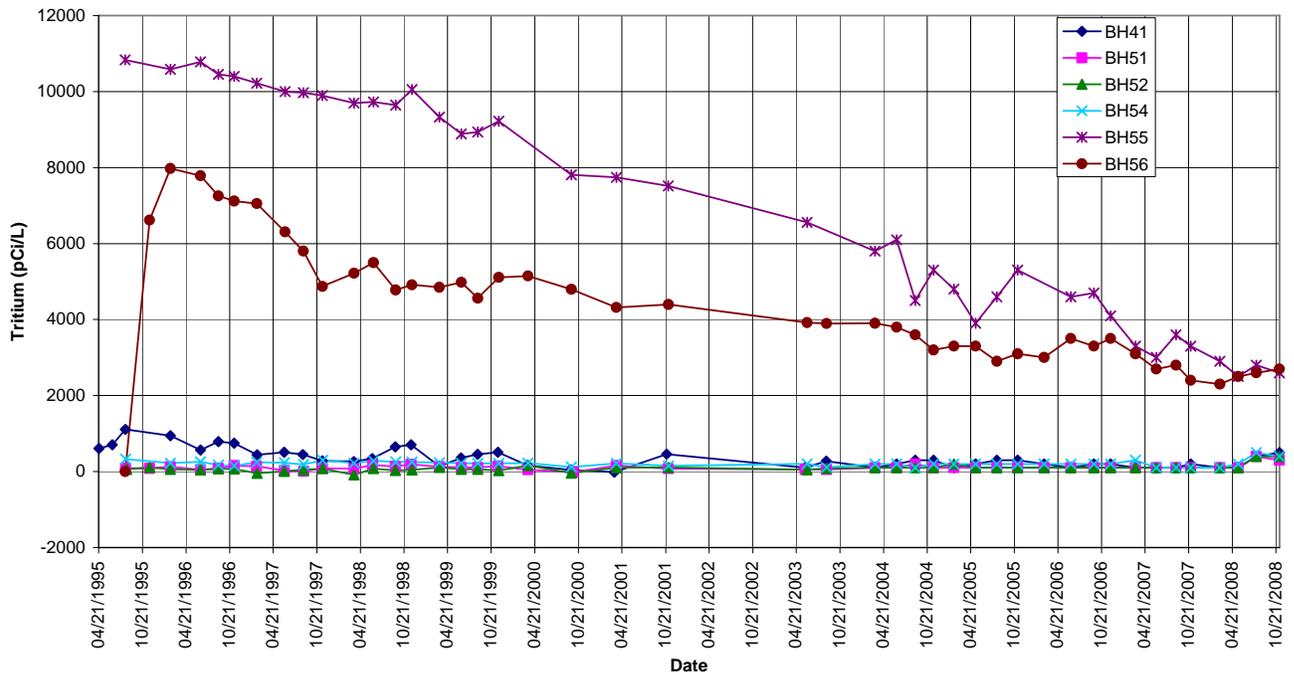


Figure 2. Tritium Activities in Groundwater in the Glacial Drift at Site A, Cook County, Illinois

**Site A/Plot M Decommissioned Reactor (SAM01)  
Strontium-90 Concentration, Site A, Glacial Drift**

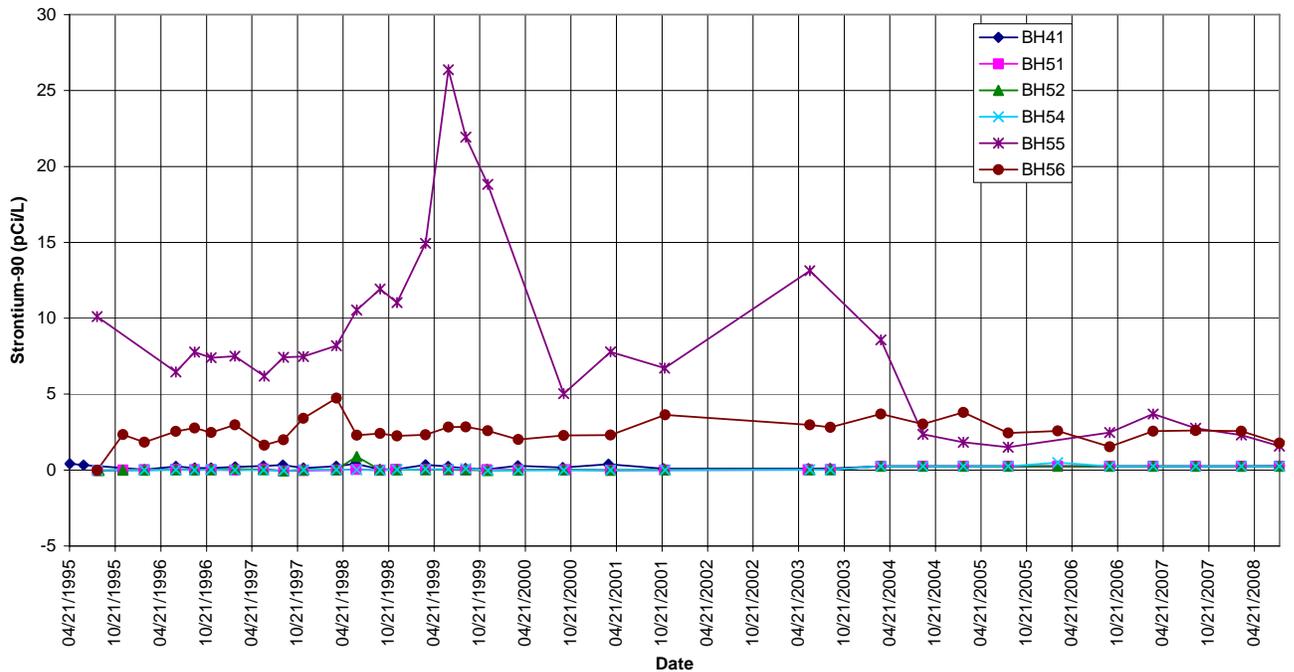


Figure 3. Strontium-90 Activities in Groundwater in the Glacial Drift at Site A, Cook County, Illinois

In 2008, at Plot M, tritium was detected in groundwater at all nine monitor wells completed in the glacial drift. Tritium concentrations ranged from 0.3 to 1,136 nCi/L (Figure 4). The highest reading was taken at BH9 on May 20, 2008; BH9 was dry for the remainder of 2008.

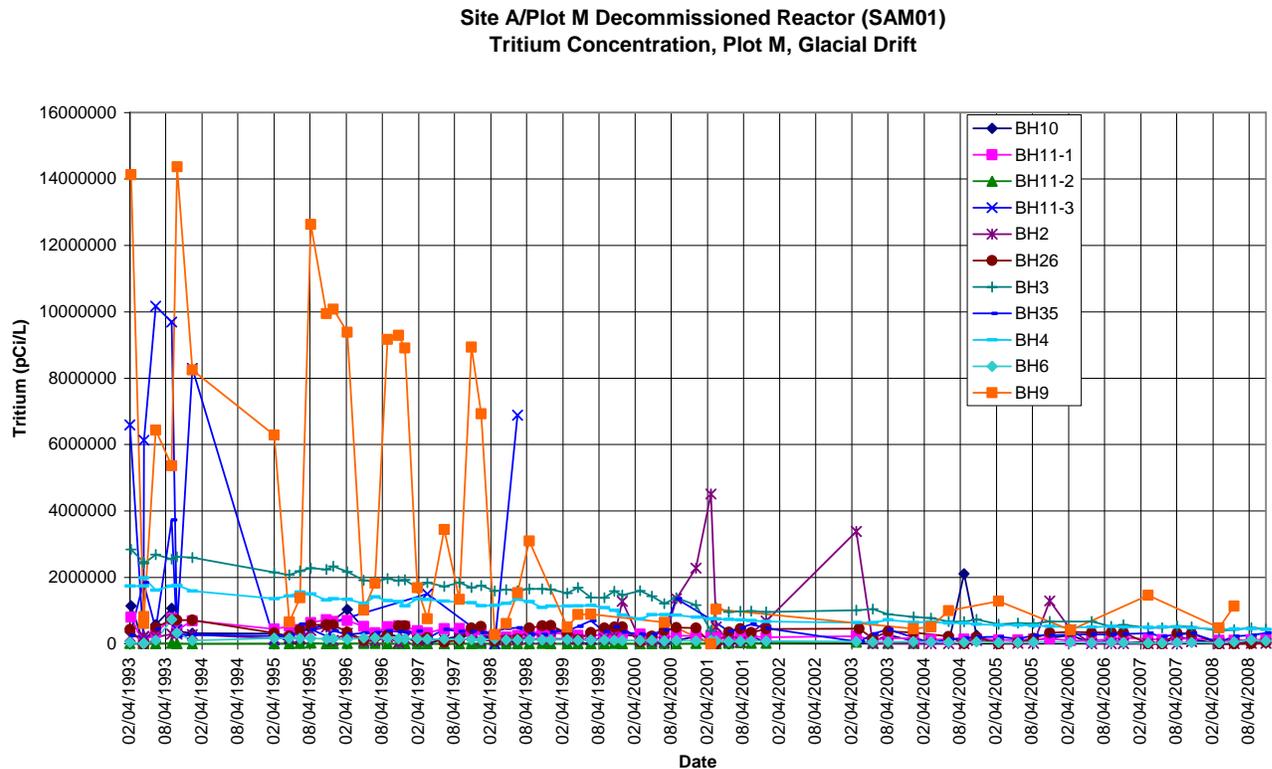


Figure 4. Tritium Activities in Groundwater in the Glacial Drift at Plot M, Cook County, Illinois

In 2008, strontium-90 occurred above the detection level in the groundwater at 5 of the 9 wells monitored at Plot M. Activities ranged from non-detect (less than 0.25 pCi/L) to 4.46 pCi/L. No strontium-90 activities exceeded the standard 8 pCi/L.

### 3.3. Groundwater—Dolomite Bedrock

In 2008, tritium was detected in the groundwater at the picnic wells at the Red Gate Woods picnic area. Activities ranged from non-detect (less than 0.1 nCi/L) to 1.24 nCi/L (Figure 5). None exceeded the standard of 20 nCi/L.

In 2008, tritium activities were detected in groundwater at all ten sample locations intercepting the dolomite bedrock north of Plot M and ranged from 0.2 to 2.3 nCi/L (Figure 6). Tritium sampling is no longer conducted in the dolomite bedrock beneath Site A. Monitoring stopped in 2004 after approximately 30 years of sampling failed to detect tritium.

**Site A/Plot M Decommissioned Reactor (SAM01)  
Tritium Concentration, Picnic Wells, Dolomite Bedrock**

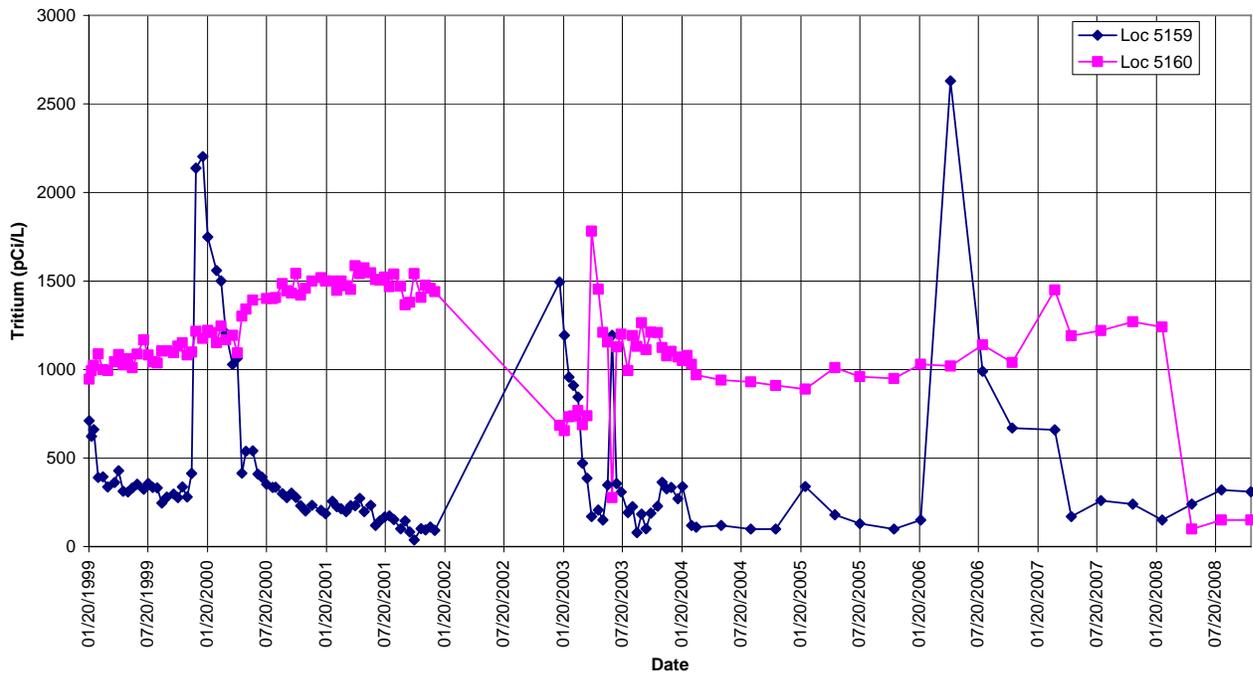


Figure 5. Tritium Activities in Groundwater in the Picnic Wells, Site A/Plot M, Cook County, Illinois

**Site A/Plot M Decommissioned Reactor (SAM01)  
Tritium Concentration, Plot M, Dolomite Bedrock**

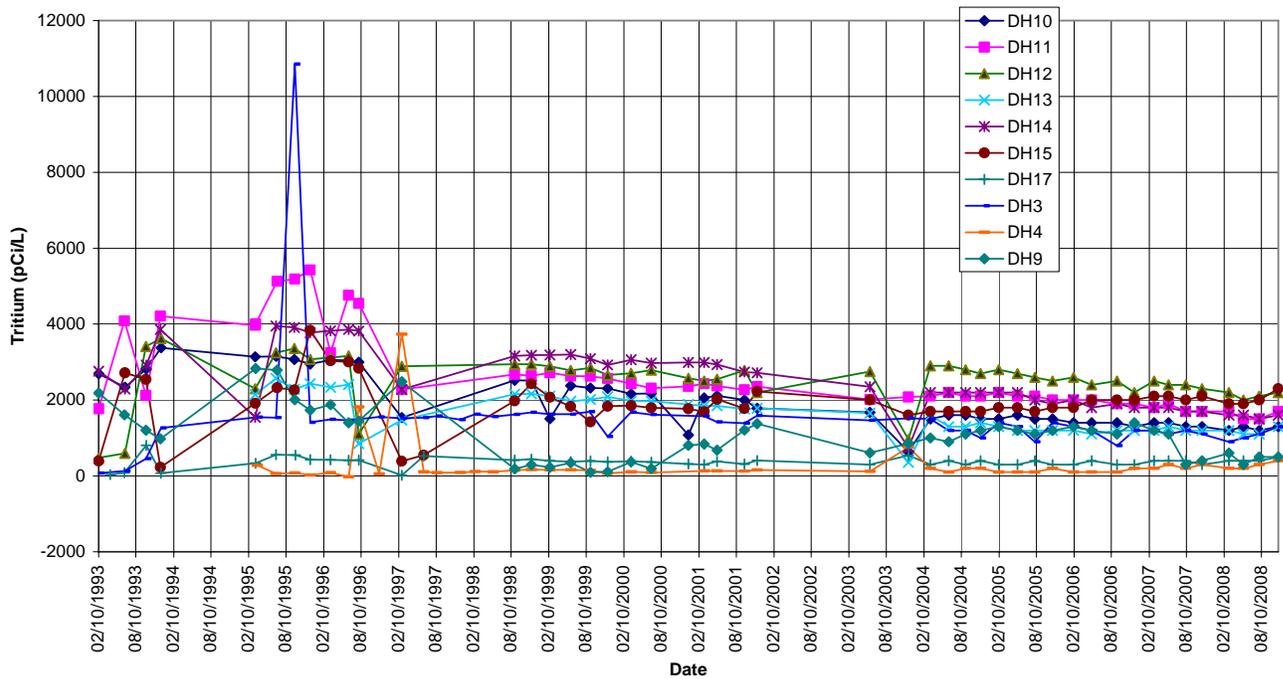


Figure 6. Tritium Activities in Groundwater in the Dolomite Bedrock, Site A/Plot M, Cook County, Illinois

### 3.4. Risk Assessment

All exposure pathways to contaminated groundwater are incomplete (handles have been removed from the picnic wells because of fecal coliform contamination and the groundwater beneath Site A/Plot M is not used for any purpose). The seep and stream flow in the spring does not pose a risk to human health or the environment because of low volume and intermittent flow (see the risk assessment summary in *Evaluation and Recommendation for Environmental Monitoring at Site A and Plot M, Palos Forest Preserve, Cook County, Illinois*, GJO-2003-462-TAC, August 2003).

### 4.0 Recommendations

1. Discussion between personnel from the DOE–Chicago Operations Office, DOE–LM, and ANL indicate that both DOE–Chicago Operations and ANL have records that need be transferred to DOE-LM (page 3).

**Recommendation:** It is recommended that DOE–LM work with DOE–Chicago Operations Office and ANL to facilitate the transfer of the records.

2. Inspectors identified two holes in the ground at Site A that appear to be associated with sanitary/sewer lines that were abandoned in place (PL–3 and PL–4) (page 3).

**Recommendation:** It is recommended that ANL fill in the holes with topsoil.

3. A large drop off is present on the access road leading to Site A at the point where the old asphalt connects with the dirt road. The drop off is present toward one side of the road, so the road remains passable at this time (page 3).

**Recommendation:** It is recommended that ANL work with the Palos Forest Preserve District to repair the drop off on the Site A access road.

4. Vegetation growth along the lower portion of the access road to Site A (near the Archer Avenue turn-off) is an on-going issue. ANL is doing a good job working with the Palos Forest Preserve District to maintain control the encroaching vegetation (page 3).

**Recommendation:** It is recommended that ANL continue to work with the forest preserve to keep the road passable from encroaching vegetation.

5. All monitor wells at Plot–M, with the exception of well 11–A (PL–10) were locked and secured (page 4).

**Recommendation:** It is recommended that ANL install a lock on Well 11–A as soon as possible.

## 5.0 Photographs

<b>Photograph Location Number</b>	<b>Azimuth</b>	<b>Photograph Description</b>
PL-1	60	Historical Marker at Site A.
PL-2	50	Monitor Well BH55, Site A.
PL-3	NA	Hole in ground at Site A.
PL-4	NA	Hole in ground at Site A.
PL-5	360	Site marker at Plot M.
PL-6	NA	Plot M Corner Marker.
PL-7	180	Erosion at Plot M.
PL-8	NA	Monitor Well DH3, Plot M.
PL-9	NA	Monitor Well BH6, Plot M.
PL-10	NA	Monitor Well 11A, missing lock, Plot M.



SAM 4/2009. PL-1. Historical Marker at Site A.



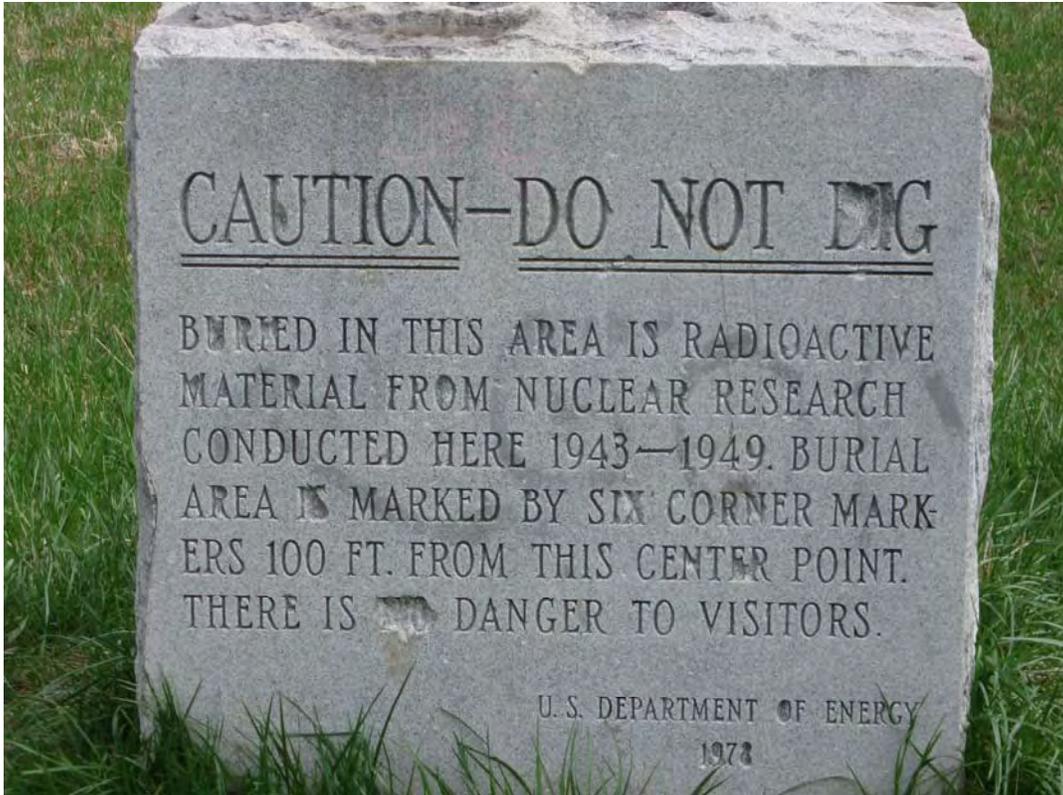
SAM 4/2009. PL-2. Monitor Well BH55, Site A.



SAM 4/2009. PL-3. Hole in ground at Site A.



SAM 4/2009. PL-4. Hole in ground at Site A.



SAM 4/2009. PL-5. Site marker at Plot M.



SAM 4/2009. PL-6. Plot M Corner Marker.



SAM 4/2009. PL-7. Erosion at Plot M.



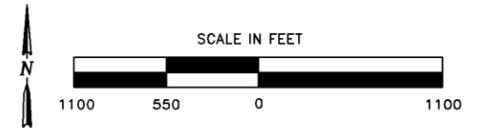
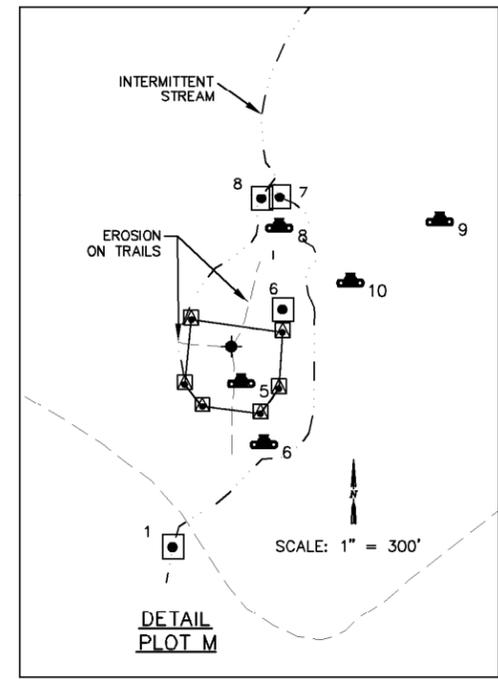
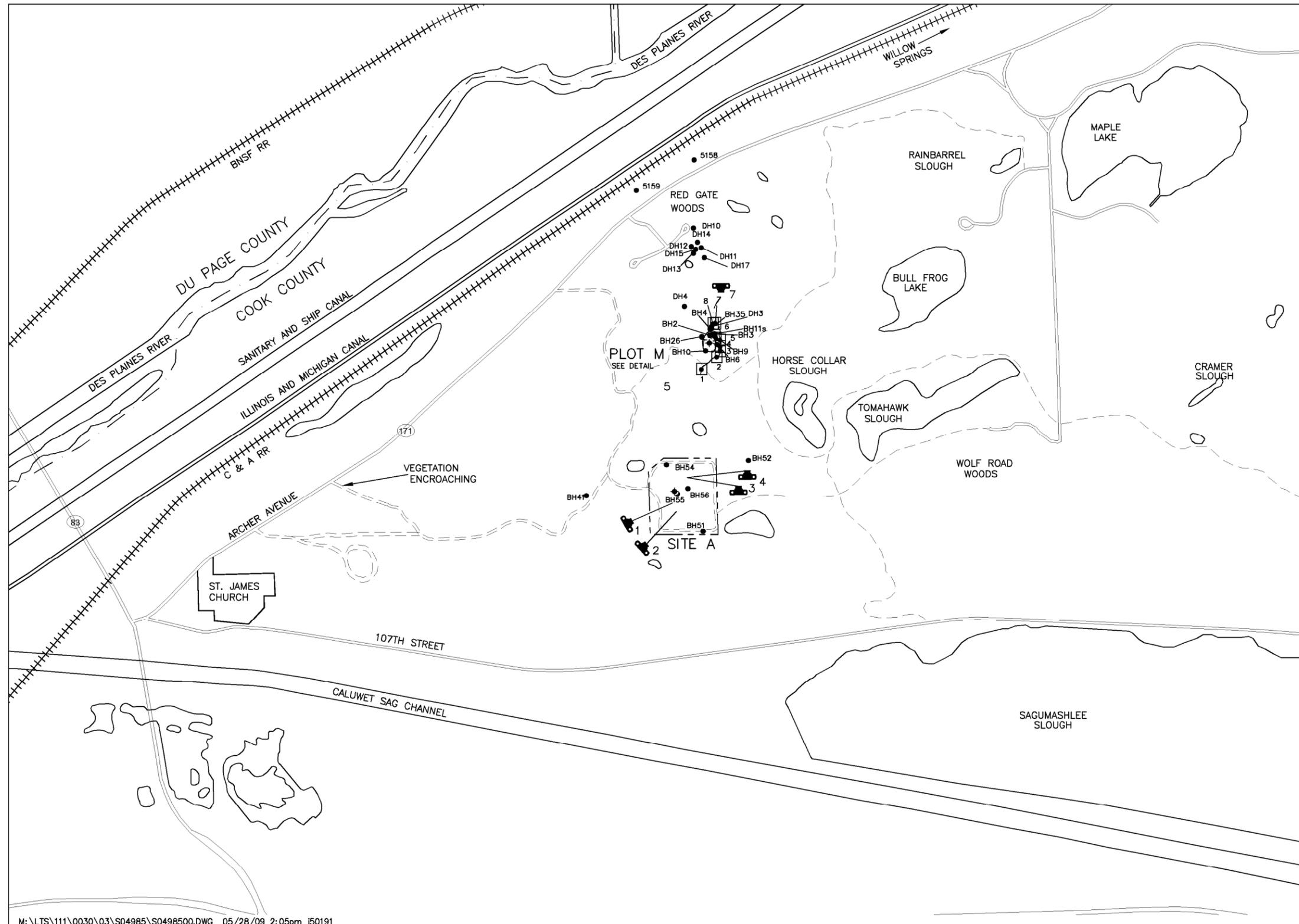
SAM 4/2009. PL-8. Monitor Well DH3, Plot M.



SAM 4/2009. PL-9. Monitor Well BH6, Plot M.



SAM 4/2009. PL-10. Monitor Well 11A, missing lock, Plot M.



**EXPLANATION**

	CORNER MARKER
	5153 PICNIC WELL
	DH2 DOLOMITE WELL
	BH28 BOREHOLE
	5 SURFACE SAMPLE LOCATION
	SITE MARKER
	SITE BOUNDARY
	DIRT ROAD
	PAVED HIGHWAY OR STREET
	NON-MOTORIZED TRAIL
	RAILROAD
	RIVER, CANAL, LAKE, POND, SLOUGH
	COUNTY LINE
	1 PHOTO LOCATION, DIRECTION, AND NUMBER

ANNUAL INSPECTION CONDUCTED  
 APRIL 28, 2009

U.S. DEPARTMENT OF ENERGY GRAND JUNCTION, COLORADO	Work Performed by S.M. Stoller Corporation Under DOE Contract No. DE-AC01-07LM00060
2009 ANNUAL INSPECTION DRAWING SITE A/PLOT M DECOMMISSIONED REACTOR COOK COUNTY, ILLINOIS	
DATE PREPARED: MAY 28, 2009	FILENAME: S0498500