SEQUOYAH FUELS
A GENERAL ATOMICS COMPANY

RE: 0551-N

November 1, 2005

U.S. Nuclear Regulatory Commission
ATTN: Mr. Myron Fliegel, Senior Project Manager
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
And Safeguards, NMSS
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852-2738

Subject: Sequoyah Fuels Corporation, SUB-1010, Docket – 40-8027
Changes To The General Arrangement Drawing

Dear Mike,

Sequoyah Fuels Corporation (SFC) has revised the General Arrangement Drawing contained in SUB-1010 due to cleanup efforts that have been completed. Pond 4, the fence around the area where Pond 4 was formerly shown, Pond 6 and the Decorative Pond have been removed from the General Arrangement Drawing to reflect current conditions at the Facility. SFC requests that Figure 3-1 of SUB-1010 license renewal application be replaced with the enclosed Figure 3-1 (Enclosure 1). No other changes to the text or conditions of the license are necessary.

Pond 4 was previously used to store licensed material and was designated as part of the Restricted Area of the Facility. Access to the pond was controlled by a fence around the pond. Pond 4 was downgraded from a Restricted Area to a Protected Area when the source materials were removed to the Process Area leaving only residual source material in the pond. SFC has removed all residual source material from Pond 4 to the Process Area, and has conducted a survey to determine the radiological status of the impoundment and surrounding area. Enclosure 2 provides the details of the Pond 4 survey. Confirmatory measurements of this area were conducted by NRC Region IV and the results are documented in IR 040-08027/05-001. The confirmatory measurements verified SFC's survey.

SFC has determined by survey that the area is well below any levels that require access control. Removing the Protected Area designation from Pond 4 is

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consistent with the requirements of SUB-1010 and 10 CFR Part 20. Neither Pond 6 nor the Decorative Pond have contained source materials and thus have not been controlled historically. As such, this change in the General Arrangement drawing is administrative in nature.

If you have any questions, please call me at (918) 489-5511, ext. 14.

Sincerely,

Craig L. Harlin
Vice President

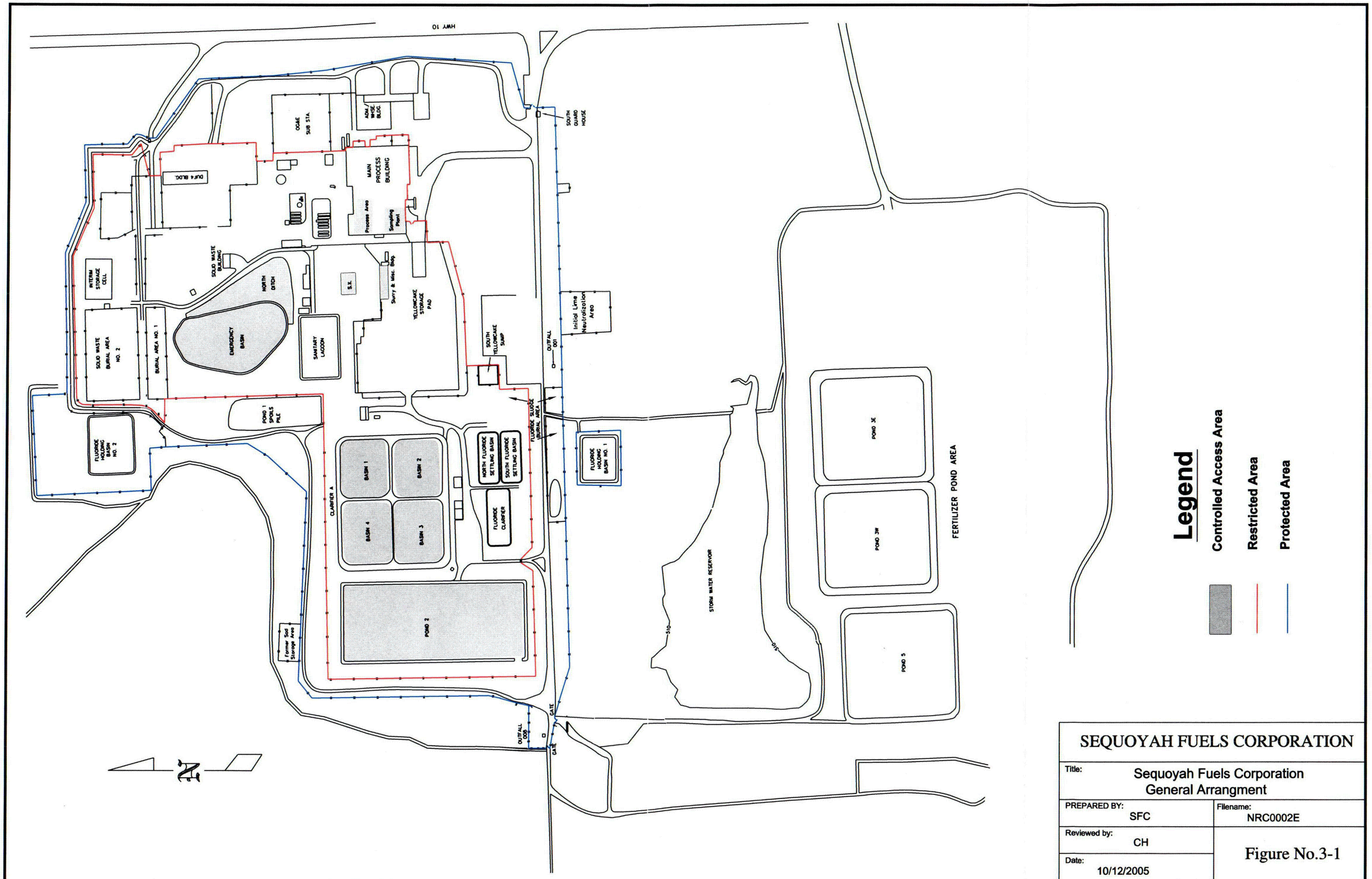
Enclosures

XC: J. Trevor Hammons, OK AG
Jeannine Hale, Cherokee Nation
Al Gutterman, Morgan, Lewis & Bockius
Bob Evans, NRC Reg IV

ENCLOSURE 1

Sequoyah Fuels Corporation
Changes to the General Arrangement Drawing

SUB-1010, Figure 3-1



SEQUOYAH FUELS CORPORATION	
Title: Sequoyah Fuels Corporation General Arrangment	
PREPARED BY: SFC	Filename: NRC0002E
Reviewed by: CH	Figure No.3-1
Date: 10/12/2005	

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ENCLOSURE 2

Sequoyah Fuels Corporation
Changes to the General Arrangement Drawing

Final Radiological Status Report
Pond 4

SEQUOYAH FUELS
A GENERAL ATOMICS COMPANY

Final Radiological Status Report

Pond 4

Sequoyah Fuels Corporation
Gore, Oklahoma

July 2005

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1.0 Introduction

Sequoyah Fuels Corporation (SFC) has conducted soil sampling and radiation surveys of Pond 4 at the Sequoyah Facility (Facility). The area of interest is shown in Figure 1.

SFC conducted uranium conversion operations at the Sequoyah Facility beginning in 1970. These operations were conducted under the authority of NRC Source Materials License SUB-1010. The uranium processing operations were conducted on an 85 acre portion of the Facility commonly referred to as the Process Area. In addition to the Process area, SFC has managed storm water and byproduct materials on additional portions of the Facility. The Process Area and the additional management areas are collectively referred to as the Industrial Area. The Industrial Area encompasses approximately 200 contiguous acres of the Facility and includes Pond 4.

Pond 4 is not required to support the operation or decommissioning of the SFC facility. SFC desires to document release of this area for unrestricted use. Pond 4 and some surrounding soils have been impacted by historical operations. The Pond 4 area has been remediated but a release survey must be conducted to demonstrate that residual radioactivity in the soils is at levels acceptable for unrestricted use.

SFC ceased production operations in 1993. A reclamation plan, describing plan decommissioning activities for the Facility was submitted to the NRC in January 2003[1]. Decommissioning activities associated with the Industrial Area include Pond 4.

1.1 Site Description

The fertilizer storage pond area originally consisted of five ponds and a fertilizer load-out station. Each pond was constructed to a capacity of two (2) million cubic feet and measures approximately 400 feet by 400 feet at the top by 25 feet deep. All ponds were clay and hypalon-lined with leak detection underdrains beneath the hypalon liner.

Construction of the ponds began with the construction of Ponds 3E and 3W (built in 1978) followed by Pond 4 (built in 1980), Pond 5 (built in 1984) and Pond 6 (built in 1985). Pond 6 and the fertilizer-loadout station were deconstructed in 2004. Pond 4 was originally used for the storage of ammonium nitrate fertilizer solution, which was a byproduct of the operation process at SFC. Later, Pond 4 was used to store raffinate sludge.

[1] Sequoyah Fuels Corporation, "Reclamation Plan", January 28, 2003.

The raffinate sludge was generated from an initial purification of the ore concentrates at the Facility. After dissolution, the uranium was purified in a solvent extraction process. Impurities, including the transformation products and metals in the feed, were removed in an acidic by-product stream called raffinate. The raffinate was neutralized with anhydrous ammonia and further treated with barium chloride causing the impurities to precipitate out of solution, forming a slurry. The slurry was transferred to a holding basin. Solid and liquid phases subsequently formed due to gravity settling. The solid phase, raffinate sludge, contains elevated uranium levels which can exceed uranium concentrations in native ores. The solid phase also contains elevated levels of transformation products of natural uranium which were present with the ore concentrates as naturally occurring impurities. The raffinate sludges was routinely pumped from the holding basin to a storage pond (e.g. Pond 4).

2.0 Survey Preparation

It was discovered in 1991 that wind had carried dried raffinate sludge out of Pond 4 and deposited it outside the east and south fencelines of Pond 4. Surface soils in these areas were excavated and removed to the Process Area. The raffinate sludge that was stored in Pond 4 was transferred to the other basins inside the Process Area in 1994 and 1995. In 1998 and 1999 the hypalon liner, some of the radiologically impacted clay liner, and the underdrains were removed from Pond 4. Additional remediation activities were completed during 2003, 2004, and 2005.

2.1 Radionuclides of Concern

The Site Characterization Report[2] (SCR) identified the primary radionuclide of concern as natural uranium (U-nat). The SCR also established areas where thorium-230 (Th-230) and radium-226 (Ra-226) must be considered as contaminants. Pond 4 is an area where Th-230 and Ra-226 must be considered as contaminants.

2.2 Residual Radioactivity Limits

The residual radioactivity limits are identified in Table 1. The limits represent contamination conditions that are approximately uniform across the survey unit.

The residual radioactivity limit for uranium is from NRC Policy and Guidance Directive FC 83-23.[3] The residual radioactivity limits for Th-230 are from

[2] Sequoyah Fuels Corporation, "Reclamation Plan", January 2003, Appendix D "Site Characterization Report".
[3] Cunningham, R.E., USNRC: NMSS, Policy and Guidance Directive FC 83-23: Termination of Byproduct, Source, and Special Nuclear Licenses, November 4, 1983.

NUREG-1620.[4] The residual radioactivity limits for Ra-226 are from 10 CFR 40, Appendix A, Criterion 6(6). [5] These limits are consistent with previous decommissioning projects at the Facility outside the Industrial Area.

2.3 Area Classification

The areas of the Facility inside the Industrial Area have been described as potentially impacted areas in the Reclamation Plan. Pond 4 soils are known to have residual contamination and therefore, in accordance with regulatory requirement[6], need some level of release survey.

2.4 Survey Units

Two units are identified for this report: inside the fence of Pond 4 and, outside the fence of Pond 4. The final status survey was applied independently to each unit with respect to 10m x 10m grid blocks (grids). The units are shown in figures 3 and 4.

2.5 Instrumentation and Survey Techniques

Two measurement methods were used to generate data for the release surveys for soils of Pond 4: soil sampling and gamma scanning. These survey techniques were combined in an integrated survey design.

2.6 Reference Areas (Background)

The reference area is described by soil sample results of total uranium, thorium-230, and radium-226, and gamma scan results of gross count rate.

2.6.1 Soil Reference

Reference area soil samples were collected from locations outside the Facility. Sample locations were selected based on owner permission, land use and management, vegetation cover, absence of debris, and accessibility. Sample locations were selected such that anthropogenic influences were minimized. Drainage pathways, paved surfaces, railroads, and agricultural (cropland) areas were avoided. Figure 2 shows the location of each reference area soil sample.

[4] U.S. Nuclear Regulatory Commission, Draft Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act, NUREG-1620, draft revision 1, January 2002.
[5] Title 10 U.S. Code of Federal Regulations Part 40, "Domestic Licensing of Source Material", Appendix A, Criterion 6(6).
[6] Ibid.

2.6.2 Gamma Scan Reference

Gross gamma measurements were made with a NaI(Tl) radiation detector coupled to a handheld scaler ratemeter. Measurements were collected by keeping the detector within two feet above ground surface while walking or driving over the area at a rate comparable to a casual walk. In open areas, the measurements were made along a straight path between opposite borders of the area being surveyed and the distance between paths was approximately five feet.

The scaler/ratemeter, along with global positioning system (GPS) equipment, was coupled to a data logger. A gamma measurement taken from the ratemeter and a location reading from the GPS unit were recorded approximately every two seconds by the data logger. The typical density of measurements for an area is 60 to 80 measurements per 100 square meters. Each measurement was recorded as gross counts per minute.

2.7 Area Preparation

A description of activities conducted to prepare the area for survey and release is provided in Appendix A. These activities may be summarized as excavation of contaminated soil.

2.8 Reference Coordinate System

A reference coordinate system was used to facilitate selection of measurement and sampling locations, and to provide a mechanism for relocating a survey point. Land area scanning surveys and soil sample locations were referenced to the Oklahoma State Plane (NAD 1983(93) horizontal-Oklahoma North 3501 US Survey Feet, NGVD 29 vertical).

3.0 Survey Design

10 CFR 40, Appendix A, Criterion 6(6) was the primary reference used for survey design. The survey design is based on a 10m x 10m ($100m^2$) grid.

3.1 Data Quality Objectives

Data quality objectives (DQO) were not specifically developed for this survey. The specificity of the release survey requirement and the absence of any statistical test did not prompt an effort to develop DQOs.

3.2 Sample Collection and Analysis Procedures

Soil sampling was conducted in accordance with Environmental Department Instruction EDI-304 "Soil and Sediment Sampling". Surface soil samples were typically collected from 0.0 – 0.5 foot interval. The samples were collected by hand auger. Chain-of-custody was conducted in accordance with Sequoyah Facility Operating Procedure G-108 "Chain-of-Custody".

The analysis technique and typical detection limit for each radionuclide of concern is provided in Table 2.

3.3 Survey Instrumentation and Techniques

Gamma scanning was conducted in accordance with Sequoyah Facility Operating Procedure G-117 "Gamma Walkover Survey". The instrumentation and technique was as described for the Reference Area. Soil surfaces were scanned for gross gamma radiation using a NaI(Tl) scintillator with a minimum detectable concentration for Ra-226 of 3 pCi/g[7].

3.4 Number of Data Points

The number of sample locations was derived in consideration of guidance relevant to application of 10 CFR 40, Appendix A, Criterion 6(6).[8] One sample was collected from each designated grid of each unit. The radiological condition of the other grids was inferred from those sampled.

There are 182 grids inside the fence of Pond 4. At least one sample was collected from 62 (34%) of the grids in this unit and used to establish the final radiological status of this unit. There are 196 grids represented outside the fence of Pond 4. A sample was collected from 49 (25%) of the grids in this unit and used to establish the final radiological status of this unit.

3.5 Power of Statistical Tests Against the DQOs

DQOs were not developed and no statistical test was performed on the sample results.

3.6 Sampling Locations

The sample may be comprised of a single plug, or may be a composite of five or nine plugs.

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[7] U.S. Nuclear Regulatory Commission (NRC), "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM). NUREG-1575, Revision 1, June 2001, Table 6-7.

[8] U.S. Nuclear Regulatory Commission (NRC), Final Report Standard Review Plan for the Review of a Reclamation Plan for Mill Tailings Sites Under Title II of the Uranium Mill Tailings Radiation Control Act, NUREG-1620, Revision 1, June 2003, Section 5.2.2 (7).

3.7 Quality Control Procedures

Quality control procedures were not developed specifically for the survey plan. SFC employed existing written quality assurance/quality control procedures during implementation of the survey plan.

3.8 Quality Assurance Project Plan

A project specific quality assurance plan was not developed for this final status survey plan.

4.0 Conducting Surveys

4.1 Reference (Background) Area Measurements and Scanning

The reference area sampling and gamma scan were part of the site characterization effort previously completed by SFC.[9]

4.1.1 Reference Area Soil Samples

Reference area soil samples were collected utilizing either a hand auger or split barrel core sampler. Vegetation and surface debris were removed prior to collection of each soil sample. Samples were placed into containers, a chain-of-custody completed, and submitted to the laboratory for analysis. Table 3 provides analytical results for reference area soil samples.

4.1.2 Reference Area Gamma Scan

A gamma scan was performed for each of the reference area soil sample locations. An average gross count per minute was derived for each reference area soil sample location from the respective data set. A grand average and standard deviation were developed from this set of reference area location averages. A baseline value was then established as the grand average plus two standard deviations. The data from which the baseline value was derived is provided in Table 4.

4.2 Preparation and Training of Field Personnel

Personnel involved with implementation of the survey plan received training on relevant procedures and the survey plan prior to participation in field activities.

[9] Sequoyah Fuels Corporation, "Reclamation Plan", January 2003, Appendix D "Site Characterization Report".

4.3 Sample Collection and Analysis

SFC collected and analyzed soil samples from Pond 4 area between 1995 and 2005. The locations of the soil samples were determined using a global positioning system. The soil sample locations are depicted in figures included in Appendix A.

4.4 Gamma Scan Survey

SFC completed a gamma scan of the areas inside and outside the fence of Pond 4 between 1995 and 2005. The gamma scan results are evaluated against the gamma scan baseline. The gamma scan results are depicted in figures included in Appendix A.

5.0 Survey Results

The results of final status survey samples and measurements are provided in the following sections. The soil sample results are evaluated against the respective residual radioactivity limit. The unity rule was applied to the soil sample results of each 100m^2 unit of Pond 4. The comparison is whether the sum of the fractions for each of U-nat, Th-230, and Ra-226 to its' respective residual radioactivity limit is less than or equal to one.

5.1 Data Assessment

The analytical results of soil samples used to establish the final radiological status of the soils inside the fence of Pond 4 are provided in Table 5a. The results provided in Table 5a are gross value; i.e. background has not been subtracted. The table shows that the sum-of-fractions is less than or equal to one for each sample, indicating that the area satisfies the condition for release for unrestricted use. The soil inside the fence of Pond 4 will be moved into the bottom of Pond 4 and covered by several feet of soil from outside the fence of Pond 4. Therefore the sum-of-fraction value for samples inside the fence of Pond 4 was calculated against the release criteria for subsurface soils. The locations of these samples are depicted in Figure 3.

The analytical results of soil samples used to establish the final radiological status of the soils outside the fence of Pond 4 are provided in Table 5b. The results provided in Table 5a are gross value; i.e. background has not been subtracted. The table shows that the sum-of-fractions is less than one for each sample, indicating that the area satisfies the condition for release for unrestricted use. The soil outside the fence of Pond 4 will be moved on top of the soil from inside the fence of Pond 4. Therefore the sum-of-fraction value for samples outside the fence of Pond 4 was calculated against the release criteria for surface soils. The locations of these samples are depicted in Figure 4.

5.2 Elevated Measurement Comparison

An elevated measurement comparison was not made for this survey.

5.3 Conduct Statistical Tests

No statistical test was completed for this survey.

6.0 Data Quality Assessment

The quality of data generated from the final status survey was controlled and monitored throughout the effort. In general, each of precision, accuracy, representativeness, completeness, and comparability were assessed.

6.1 Precision

Precision was evaluated with respect to laboratory analyses by means of laboratory control samples. The laboratory control sample and laboratory control sample duplicate results were compared by calculating a relative percent difference (RPD) between the two results. The laboratory approved the sample results in all cases.

Precision was also evaluated with respect to sample collection by means of duplicate samples. The duplicate results were compared by calculating a RPD between the two results of a duplicate pair. There were 16 field duplicates. The RPDs are reported in Table 6. The cases of RPD greater than 50% are not significant because either the area was remediated after sample collection (HA-705, Th-230), or the RPD is unduly influenced by the small value of the results (e.g. HA-512, Ra-226), or the average result is substantially below the residual radioactivity limits (e.g. HA-503, Th-230).

The gamma scan probe and scaler/ratemeter were calibrated on a semiannual basis. An operability check was successfully completed for this instrument prior to use each day.

6.2 Accuracy

Accuracy was evaluated with respect to laboratory analyses by means of method blanks, matrix spikes and matrix spike duplicates. Method blanks were run with each laboratory batch. Matrix spike and matrix spike duplicates were evaluated with respect to percent recovery. The laboratory approved the sample results in all cases.

Accuracy was also evaluated with respect to sample collection by means of replicate samples. The replicate results were compared by calculating a RPD between the two results of a duplicate pair. There were three field replicates.

The RPDs are reported in Table 7. The two cases of RPD greater than 50% are not significant because either the area was remediated after sample collection (HA-705, Th-230) or the RPD is unduly influenced by the small value of the results (HA-727, Ra-226).

6.3 Representativeness

Representativeness was qualitatively assessed. Representativeness was assured by sampling in accordance with a predetermined plan and adherence to written procedures for soil and sediment sampling, and gamma survey.

6.4 Completeness

Completeness was evaluated by comparison of valid data collected to the amount of data expected to be obtained. Data completeness was also evaluated with respect to sample location access and sample loss.

The completeness criteria included assurance of use of proper analytical method, review of quality control data, check and confirmation of calculations, and approval of final laboratory data. Review of chains-of-custody and final laboratory reports confirmed the proper analytical method was used during analysis of samples. Review of associated quality control data revealed no instances of unacceptable data sets. Checks and confirmations of calculations indicated no unresolved discrepancies. Each data set was approved by the laboratory.

6.5 Comparability

Comparability was assessed by evaluation of whether subsequent data sets can be compared the data presented here. Several conditions allow for a favorable assessment. These conditions are:

- The sampling plan provided for collection of representative samples;
- Sample constituents measured in each sample were reported in the correct units;
- Data quality was confirmed acceptable by the laboratory and the client; and

Comparability was also evaluated with respect to sample collection and analyses by means of splitting samples with the NRC[10]. The split-sample results were compared by calculating a RPD between the two results of a sample pair. There were four field split-samples. The RPDs are reported in Table 8. The two sets of sample results are comparable for Th-230 and Ra-

[10] U.S. Nuclear Regulatory Commission, Region IV, Inspection Report 040-08027/05-001, July 20, 2005.

226. Although the uranium results exhibit large RPDs, the condition is not of concern since the results are substantially below the residual radioactivity limits.

Results of samples and surveys are consistent with results of prior samples and surveys, and the expected level of contamination.

7.0 Conclusion

A radiological survey was performed to determine whether residual radioactivity in the soils in and surrounding Pond 4 satisfies predetermined criteria for release for unrestricted use. The survey results provide data to demonstrate that the radiological parameters of interest do not exceed established soil concentrations acceptable for unrestricted use.

Table 1

Residual Radioactivity Limits for Soil

Condition	Uranium-nat[1] µg/g	Thorium-230[2] pCi/g	Radium-226[2] pCi/g
Limit	52	≤14 / ≤43	≤5.0 / ≤15

[1] 35 pCi/g
[2] First 15cm below surface / 15cm layers more than 15cm below surface

Table 2

Identification of Radioanalytical Methods for Final Radiological Status of Pond 4

Radionuclide	Analytical Method	Detection Limit[1] pCi/g
Total Uranium	kinetic phosphorescence analysis	0.7
Thorium-230	alpha spectrometry	0.5
Radium-226	co-precipitation, gross alpha and gross beta	0.1

[1] nominal values

Table 3

Reference Area Soil Sample Results[1]

Location ID	Depth (feet)	Sample Date	Total uranium (µg/g)	Th-230 (pCi/g)	Ra-226 (pCi/g)
HA288	0.00 – 0.50	11/07/05	3.9	1.1	1.4
HA289	0.00 – 0.50	11/07/05	3.7	0.9	0.9
HA290	0.00 – 0.50	11/07/05	2.7	0.6	0.7
HA291	0.00 – 0.50	11/07/05	3.9	0.6	0.9
HA292	0.00 – 0.50	11/07/05	3.1	0.6	0.7
HA293	0.00 – 0.50	11/07/05	3.2	1.0	1.4
HA294	0.00 – 0.50	11/07/05	3.3	0.8	1.0
HA295	0.00 – 0.50	11/07/05	3.4	1.0	0.9
HA296	0.00 – 0.50	11/07/05	3.1	0.4	1.1
HA297	0.00 – 0.50	11/07/05	3.3	0.5	1.0
HA298	0.00 – 0.50	11/07/05	3.8	0.9	1.7
HA299	0.00 – 0.50	11/07/05	3.1	1.0	0.7
HA300	0.00 – 0.50	11/07/05	1.2	0.4	0.7
HA307	0.00 – 0.50	11/07/05	3.3	0.8	1.0
HA308	0.00 – 0.50	11/07/05	3.1	0.7	1.25
	Average		3.2	0.8	1.0
	Standard Deviation		0.7	0.2	0.3

[1] Chain-of-Custody SF04-0390

Table 4

Reference Area Gamma Scan Results

Location ID	Minimum (cpm)	Maximum (cpm)	Average (cpm)	Std. Dev. (cpm)
HA288	9097	12930	10826	856
HA289	10901	14707	12455	1178
HA290	5485	6969	6166	438
HA291	7204	10527	8515	841
HA292	7879	11598	9142	1024
HA293	5168	9296	7349	1062
HA294	6802	10354	8694	841
HA295	7981	10934	9352	722
HA296	5660	9071	7183	831
HA297	10208	14421	11707	956
HA298	6392	11557	9017	1056
HA299	10111	12279	11074	560
HA300	8934	11072	9964	586

Grand Average	9342
Standard Deviation	1845
Baseline Value	13032

Table 5a, Analytical Results of Final Radiological Status Samples - Inside Fence

Date	Location ID	Sample Depth (ft) Top	Bottom	Radionuclide Concentration U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g	Sum of Fractions
1999 Composites [a, b]							
	HA503 [c]	0.50	1.00	na	na	na	---
	HA504	0.00	0.50	5	13	2	0.5
	HA506	0.00	0.50	6	15	1	0.5
	HA507	0.00	0.50	7	17	2	0.7
	HA508	0.00	0.50	7	21	3	0.8
	HA511	0.00	0.50	10	24	2	0.9
	HA512	0.00	0.50	4	1	1	0.2
	HA513	0.00	0.50	5	2	2	0.3
	HA514	0.00	0.50	4	1	1	0.2
	HA515	0.00	0.50	5	3	2	0.3
	HA517	0.00	0.50	6	8	2	0.4
	HA518	0.00	0.50	9	21	2	0.8
	HA519	0.00	0.50	5	1	1	0.2
	HA520	0.00	0.50	5	5	2	0.3
1999 Composites of Underdrains							
	HA521	0.00	0.50	11.0	19.0	1.5	0.8
	HA522	0.00	0.50	5.0	22.0	2.1	0.7
	HA523	0.00	0.50	3.9	16.0	1.5	0.5
	HA524	0.00	0.50	6.5	8.0	1.6	0.4
	HA525	0.00	0.50	7.3	22.0	2.2	0.8
September - October 2003							
	HA-560	0.00	0.50	2	14	1	0.4
	HA-561 [c]	0.50	1.00	3	9	1	0.3
	HA-562	0.00	0.50	7	24	2	0.8
	HA-563	0.25	0.75	1	0	1	0.1
	HA-564	1.00	1.50	2	3	0	0.1
	HA-565	0.50	1.00	1	2	3	0.2
	HA-566	0.75	1.25	3	20	1	0.6
	HA-567	0.50	1.00	2	6	1	0.3
	HA-568 [c]	1.50	2.00	3	5	1	0.2
	HA-569 [c]	1.50	2.00	5	22	1	0.7
	HA-570	1.50	2.00	8	25	2	0.9
	HA-571	2.00	2.50	1	1	1	0.1
	HA-572	2.00	2.50	5	14	2	0.5
	HA-573	1.50	2.00	3	22	3	0.7
	HA-574	0.00	0.50	3	0	1	0.1
	HA-575	0.00	0.50	3	0	1	0.1
	HA-576	0.00	0.50	3	0	1	0.1
	HA-577	0.00	0.50	2	2	1	0.4
	HA-631	0.00	0.50	3	0	1	0.3

Table 5a, Analytical Results of Final Radiological Status Samples - Inside Fence

Date	Location ID	Sample Depth (ft) Top	Bottom	Radionuclide Concentration U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g	Sum of Fractions
August 2004							
	HA-653	0.00	0.50	2	1	1	0.1
	HA-654	0.00	0.50	2	1	1	0.1
	HA-655	0.00	0.50	2	1	1	0.1
	HA-656	0.00	0.50	1	1	1	0.1
	HA-657	0.00	0.50	2	1	1	0.1
	HA-658	0.00	0.30	2	6	1	0.2
	HA-659	0.00	0.50	2	0	1	0.1
	HA-639 [c]	0.00	0.50	2	2	1	0.1
September 2004 [a,d]							
	SD-244	sediment grab		5	13	2	0.5
	SD-245	sediment grab		6	31	2	1.0
	SD-246	sediment grab		6	25	3	0.9
	SD-248	sediment grab		6	25	2	0.8
	SD-250	sediment grab		4	27	2	0.9
	SD-252	sediment grab		5	31	2	0.9
	SD-253	sediment grab		5	34	2	1.0
	SD-255	sediment grab		5	22	1	0.7
	HA-661	0.00	0.50	2	1	1	0.1
	HA-662	0.00	0.50	3	2	1	0.1
	HA-663	0.00	0.50	3	1	1	0.1
	HA-664	0.00	0.50	4	2	1	0.2
	HA-665	0.00	0.50	7	27	1	0.8
	HA-666	0.00	0.50	5	1	7	0.6
October 2004[a]							
	HA-680	0.00	0.50	4	11	1	0.4
	HA-681	0.00	0.50	3	3	1	0.2
	HA-683	0.00	0.50	3	2	1	0.2
November 2004[c]							
	HA-685	0.00	0.50	3	1	1	0.2
	HA-686	0.00	0.50	3	1	1	0.2
	HA-687	0.00	0.50	3	1	1	0.1
	HA-688	0.00	0.50	3	4	1	0.2
	HA-689	0.00	0.50	3	1	0	0.1
	HA-690	0.00	0.50	3	6	1	0.3

Table 5a, Analytical Results of Final Radiological Status Samples - Inside Fence

Date	Location ID	Sample Depth (ft) Top	Bottom	Radionuclide Concentration U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g	Sum of Fractions
December 2004[a,e]							
	HA-691	0.00	0.50	6	22	2	0.8
	HA-692	0.00	0.50	6	22	2	0.7
	HA-693	0.00	0.50	6	26	2	0.9
	HA-694	0.00	0.50	6	15	2	0.6
	HA-695	0.00	0.50	4	2	1	0.2
	HA-696	0.00	0.50	5	17	1	0.6
	HA-697	0.00	0.50	7	24	2	0.8
	HA-698	0.00	0.50	7	23	2	0.8
	HA-699	0.00	0.50	5	15	1	0.5
	HA-701	0.00	0.50	4	5	2	0.3
	HA-702	0.00	0.50	4	5	1	0.2
	HA-703	0.00	0.50	6	15	1	0.5
	HA-704	0.00	0.50	4	2	2	0.2
	HA-706	0.00	0.50	3	10	1	0.4
	HA-707	0.00	0.50	4	8	1	0.4
	HA-708	0.00	0.50	3	6	1	0.2
	HA-709	0.00	0.50	7	30	2	1.0
	HA-710	0.00	0.50	6	28	2	0.9
	HA-711	0.00	0.50	7	25	2	0.8
	HA-712	0.00	0.50	6	24	2	0.8
	HA-713	0.00	0.50	7	29	2	0.9
	HA-714	0.00	0.50	7	24	2	0.8
	HA-715	0.00	0.50	6	27	2	0.9
March 2005[c,e]							
	HA-725	0.00	0.50	5	14	1	0.5
May 2005[c,e]							
	HA-727	0.00	0.50	4	15	1	0.5
May 2005[f]							
	HA-728	0.00	0.50	5	20	1	0.7
	HA-729	0.00	0.50	6	25	2	0.8
	HA-730	0.00	0.50	4	10	2	0.4
	HA-731	0.00	0.50	5	21	2	0.7

[a] The soil represented by samples HA-505, HA509, HA-510, HA-679, HA-682, HA-684, HA-700, HA-705, and HA-726 was removed to the Process Area.

[b] The soil represented by sample HA-516 was from the underdrains and was removed to the Process Area. The underlying soil was sampled as HA521 through HA-525.

[c] The soil originally overlying this area (e.g. 0.00 to 0.50 foot increment) was removed to the Process Area.

[d] The sediment represented by samples SD-247, SD-249, SD-251, and SD-254 was removed to the Process Area.

[e] The samples were composites of five plugs evenly spaced within a 10m x 10m square.

[f] The sample was a single plug and was split with NRC at time of collection.

Table 5b, Analytical Results of Final Radiological Status Samples - Outside Fence

Date	Location ID	Sample Depth (ft) Top	Bottom	Radionuclide Concentration U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g	Sum of Fractions
1997 Gamma Scan							
	HA466	0.00	0.50	3	3	1	0.4
	HA468	0.00	0.50	5	1	1	0.4
	HA469	0.00	0.50	2	2	1	0.5
	HA470	0.00	0.50	4	2	1	0.4
	HA471	0.00	0.50	4	1	1	0.4
September - October 2003							
	HA-578	0.00	0.50	4	0	1	0.3
	HA-579	0.00	0.50	3	0	1	0.3
	HA-580	0.00	0.50	7	0	2	0.5
	HA-581 *	0.50	1.00	3	0	1	0.2
	HA-582 *	0.50	1.00	4	0	1	0.3
	HA-583	0.00	0.50	4	2	1	0.5
	HA-584 *	0.50	1.00	3	2	1	0.3
	HA-585	0.00	0.50	4	6	1	0.8
	HA-586	0.00	0.50	3	0	1	0.3
	HA-587	0.00	0.50	3	0	1	0.3
	HA-588	0.00	0.50	3	3	2	0.6
	HA-589	0.00	0.50	4	7	1	0.8
	HA-590	0.00	0.50	3	0	1	0.3
	HA-591 *	0.50	1.00	3	2	1	0.3
	HA-592	0.00	0.50	4	3	1	0.5
	HA-593	0.00	0.50	4	3	1	0.5
	HA-594	0.00	0.50	2	0	1	0.2
	HA-595	0.00	0.50	4	2	1	0.4
	HA-596	0.00	0.50	3	1	1	0.3
	HA-597	0.00	0.50	3	0	1	0.2
	HA-598	0.00	0.50	4	1	1	0.3
	HA-599	0.00	0.50	3	1	3	0.6
	HA-600	0.00	0.50	5	2	1	0.4
	HA-601	0.00	0.50	4	1	1	0.3
	HA-602	0.00	0.50	4	0	3	0.7
	HA-603	0.00	0.50	5	1	1	0.4
	HA-604	0.00	0.50	13	0	1	0.4
	HA-605	0.00	0.50	5	0	1	0.3
	HA-606	0.00	0.50	6	0	1	0.3
	HA-607	0.00	0.50	10	2	1	0.5
	HA-608	0.00	0.50	6	0	2	0.5
	HA-609	0.00	0.50	5	0	1	0.3
	HA-610	0.00	0.50	5	0	1	0.3
	HA-611	0.00	0.50	5	2	1	0.5

Table 5b, Analytical Results of Final Radiological Status Samples - Outside Fence

Date	Location ID	Sample Depth (ft) Top	Bottom	Radionuclide Concentration U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g	Sum of Fractions
	HA-612	0.00	0.50	4	0	1	0.3
	HA-632	0.00	0.50	4	0	1	0.2
	HA-633	0.00	0.50	4	0	1	0.3
	HA-634	0.00	0.50	3	1	1	0.3
	HA-635	0.00	0.50	3	1	1	0.3
	HA-636	0.00	0.50	3	1	1	0.3
	HA-637	0.00	0.50	4	0	1	0.3
	HA-638	0.00	0.50	3	0	1	0.2
	HA-639 *	0.50	1.00	3	2	1	0.3
	HA-640	0.00	0.50	3	4	1	0.5
October 2004							
	HA-678 *	0.00	0.33	7	3	1	0.4

* The soil originally overlying this area (e.g. 0.00 to 0.50 foot increment) was removed to the Process Area.

na = no analysis available

Table 6, Analytical Results of Duplicate Samples

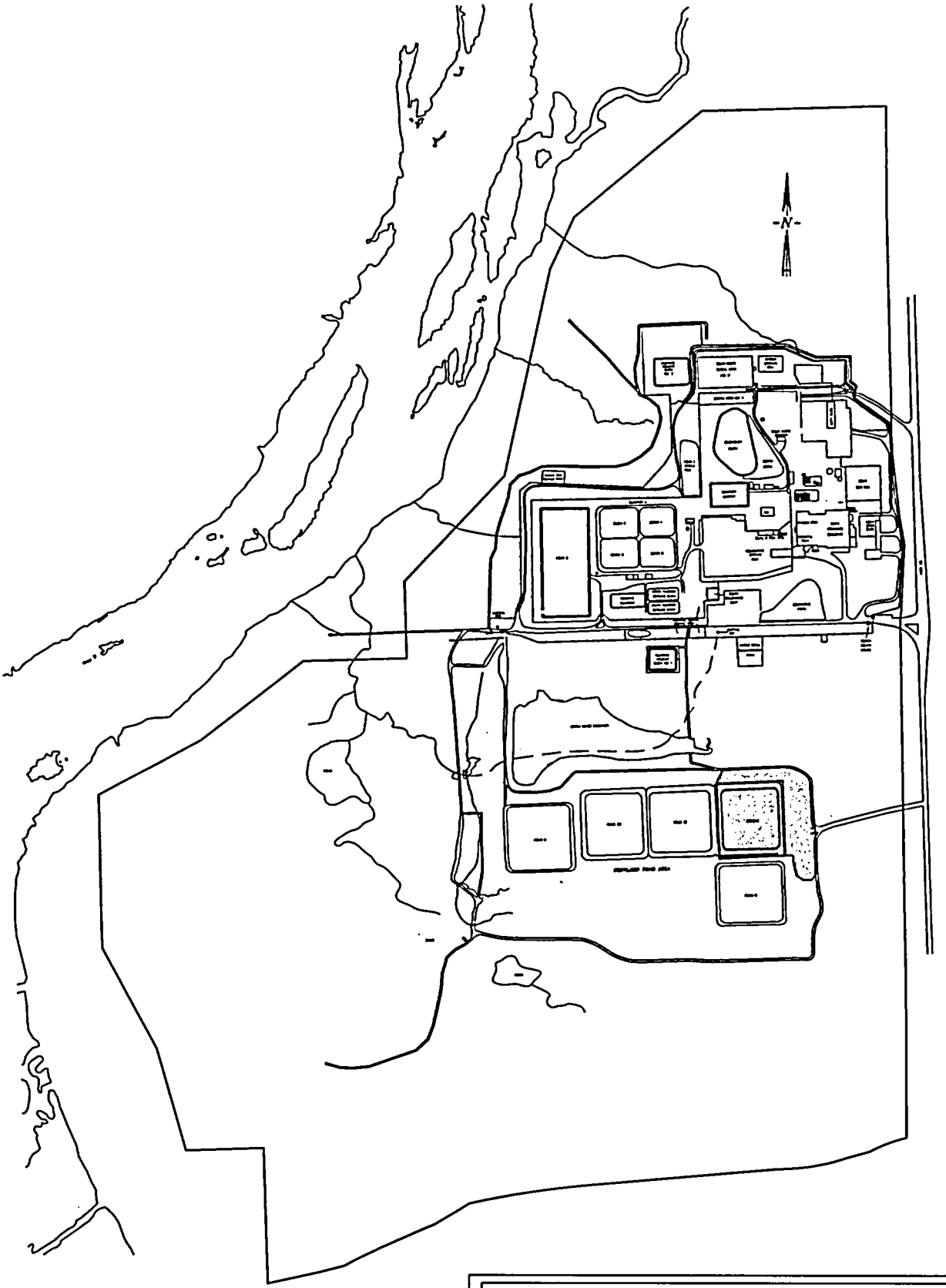
	Sample ID	Sample Depth	Radionuclide Concentration Ra-226 pCi/g	Th-230 pCi/g	U-total ug/g
	HA-461	0.00 - 0.50	0.3	2.8	4.1
Q	HA-461	field duplicate	0.3	9.4	8.4
		relative percent difference, %	0	108	69
	HA-503	0.00 - 0.50	2.1	32.7	10.0
	SEQ008	field duplicate	2.0	14.3	5.5
		relative percent difference, %	5	78	58
	HA-509	0.00 - 0.50	2.7	32.7	11.0
	SEQ009	field duplicate	2.2	47.1	12
		relative percent difference, %	20	36	9
	HA-512	0.00 - 0.50	1.4	0.6	4.2
	SEQ010	field duplicate	0.3	0.8	1.7
		relative percent difference, %	129	29	85
	HA-521	0.00 - 0.50	1.5	19.0	na
Q	HA-521	field duplicate	1.1	12.0	na
		relative percent difference, %	31	45	na
	HA-561	0.00 - 0.50	3.1	102.0	16.0
Q	HA-561	field duplicate	4.4	137.0	21.1
		relative percent difference, %	36	29	27
	HA-560	0.00 - 0.50	1.2	13.8	1.7
Q	HA-560	field duplicate	0.7	5.5	2.2
		relative percent difference, %	48	85	26
	HA-642	1.50 - 2.00	1.8	0.0	0.7
Q	HA-642	field duplicate	1.0	0.0	2.7
		relative percent difference, %	60	0.0	117
	HA-579	0.00 - 0.50	1.3	0.2	3.2
Q	HA-579	field duplicate	0.9	0.0	3.3
		relative percent difference, %	38	200	3
	HA-598	0.00 - 0.50	0.9	1.2	4.0
Q	HA-598	field duplicate	1.7	0.6	4.0
		relative percent difference, %	66	70	1
	HA-653	0.00 - 0.50	0.5	0.6	1.6
Q	HA-653	field duplicate	0.7	1.0	1.6
		relative percent difference, %	29	41	4
	SD-245	0.00 - 0.50	2.3	31.1	6.4
Q	SD-245	field duplicate	1.9	22.9	5.8
		relative percent difference, %	20	30	10
	HA-694	0.00 - 0.50	2.3	15.3	5.8
Q	HA-694	field duplicate	1.4	18.6	5.6
		relative percent difference, %	49	19	4
	HA-705	0.00 - 0.50	1.7	19.2	6.2
Q	HA-705	field duplicate	2.4	35.4	7.4
		relative percent difference, %	33	59	18
	HA-727	0.00 - 0.50	0.6	15.3	3.7
Q	HA-727	field duplicate	1.7	14.0	4.4
		relative percent difference, %	91	9	17
	HA-729	0.00 - 0.50	1.7	24.8	5.6
Q	HA-729	field duplicate	2.0	22.1	5.4
		relative percent difference, %	18	12	3

Table 7, Analytical Results of Replicate Samples

	Sample ID	Sample Depth	Radionuclide Concentration Ra-226 pCi/g	Th-230 pCi/g	U-total ug/g
	HA-696	0.00 - 0.50	1.1	16.7	5
Q	HA-696	field replicate	0.7	10.2	5
		relative percent difference, %	47	48	12
	HA-705	0.00 - 0.50	1.7	19.2	6
Q	HA-705	field replicate	1.8	32.7	7
		relative percent difference, %	2	52	6
	HA-727	0.00 - 0.50	0.6	15.3	4
Q	HA-727	field replicate	1.5	12.0	4
		relative percent difference, %	83	24	10

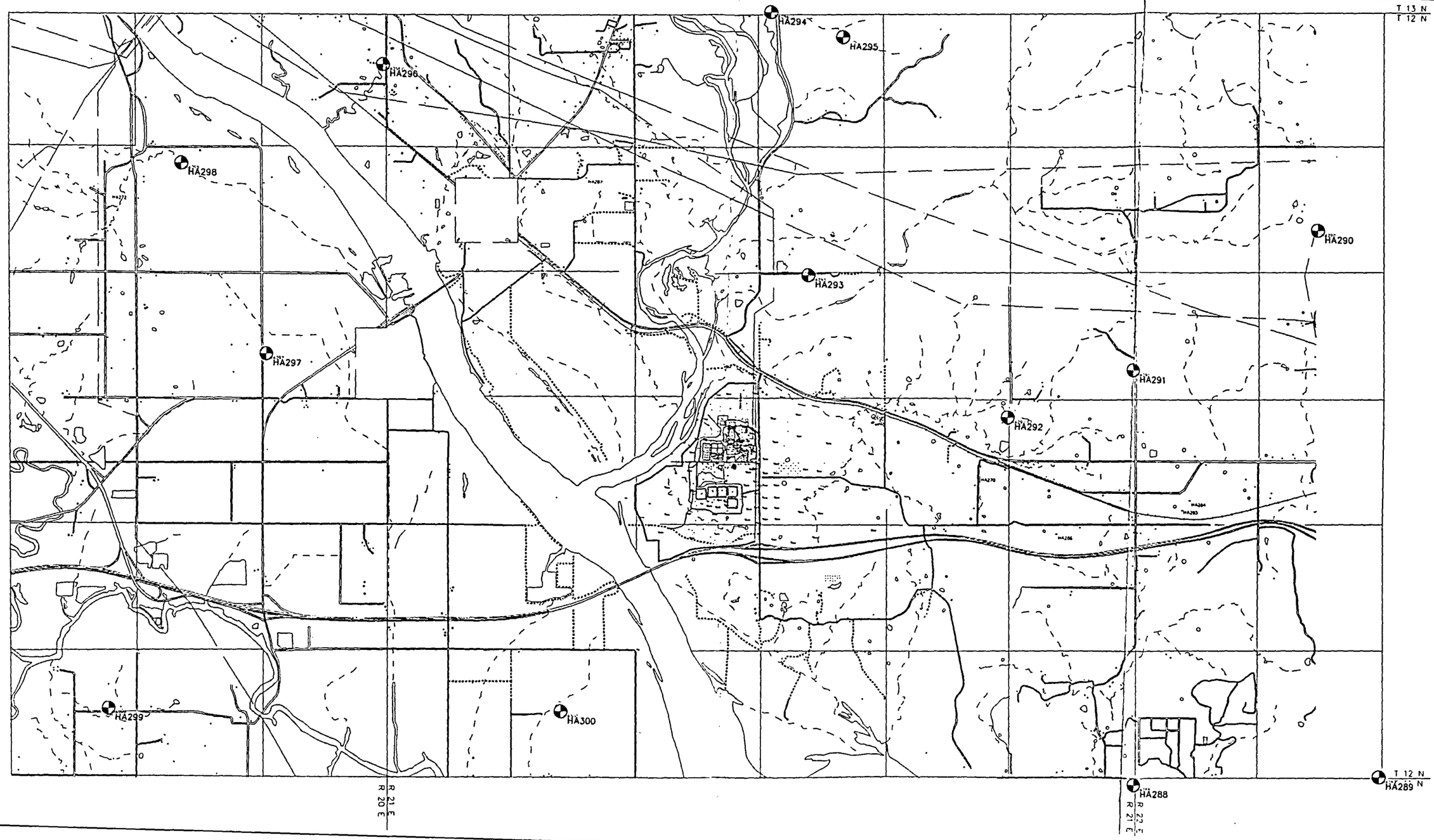
Table 8, Analytical Results of Samples Split with NRC (field duplicates)

	Sample ID	Sample Depth	Radionuclide Concentration Ra-226 pCi/g	Th-230 pCi/g	U-total ug/g
	HA-728	0.00 - 0.50	1.5	20.2	5
NRC	HA-728	field duplicate	1.3	18.9	10
		relative percent difference, %	9	7	66
	HA-729	0.00 - 0.50	1.7	24.8	6
NRC	HA-729	field duplicate	1.5	22.6	14
		relative percent difference, %		9	86
	HA-730	0.00 - 0.50	1.6	9.6	4
NRC	HA-730	field duplicate	1.0	7.0	6
		relative percent difference, %	44	32	55
	HA-731	0.00 - 0.50	1.7	21.1	5
NRC	HA-731	field duplicate	1.2	18.3	12
		relative percent difference, %	35	14	81



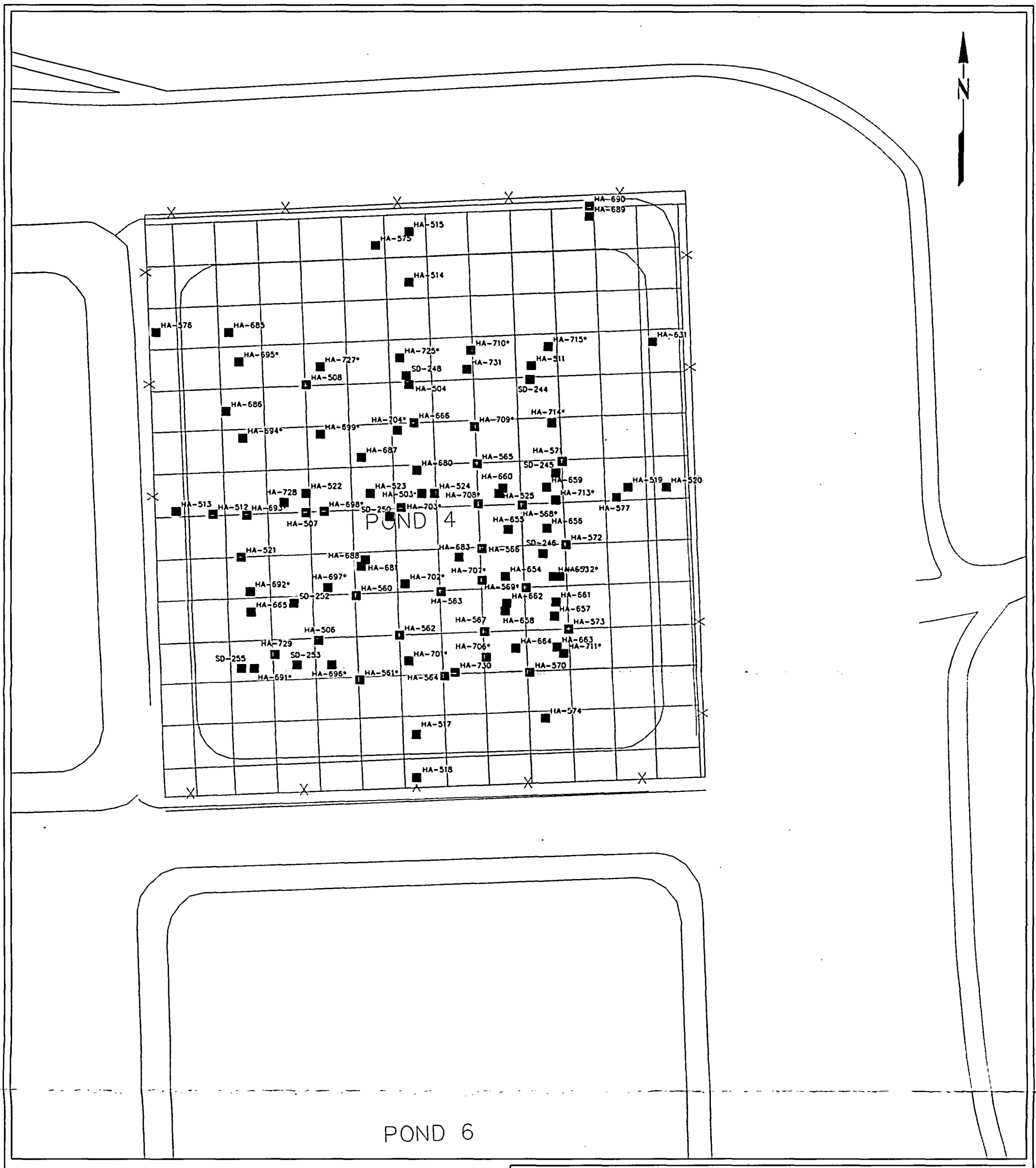
Pond 4 Area

SEQUOYAH FUELS CORPORATION	
TITLE: General Facility Layout	
PREPARED BY: SFC	FILENAME: Pond4_figure1.dwg
REVIEWED BY: RHM	FIGURE NO. 1
DATE: July 2005	

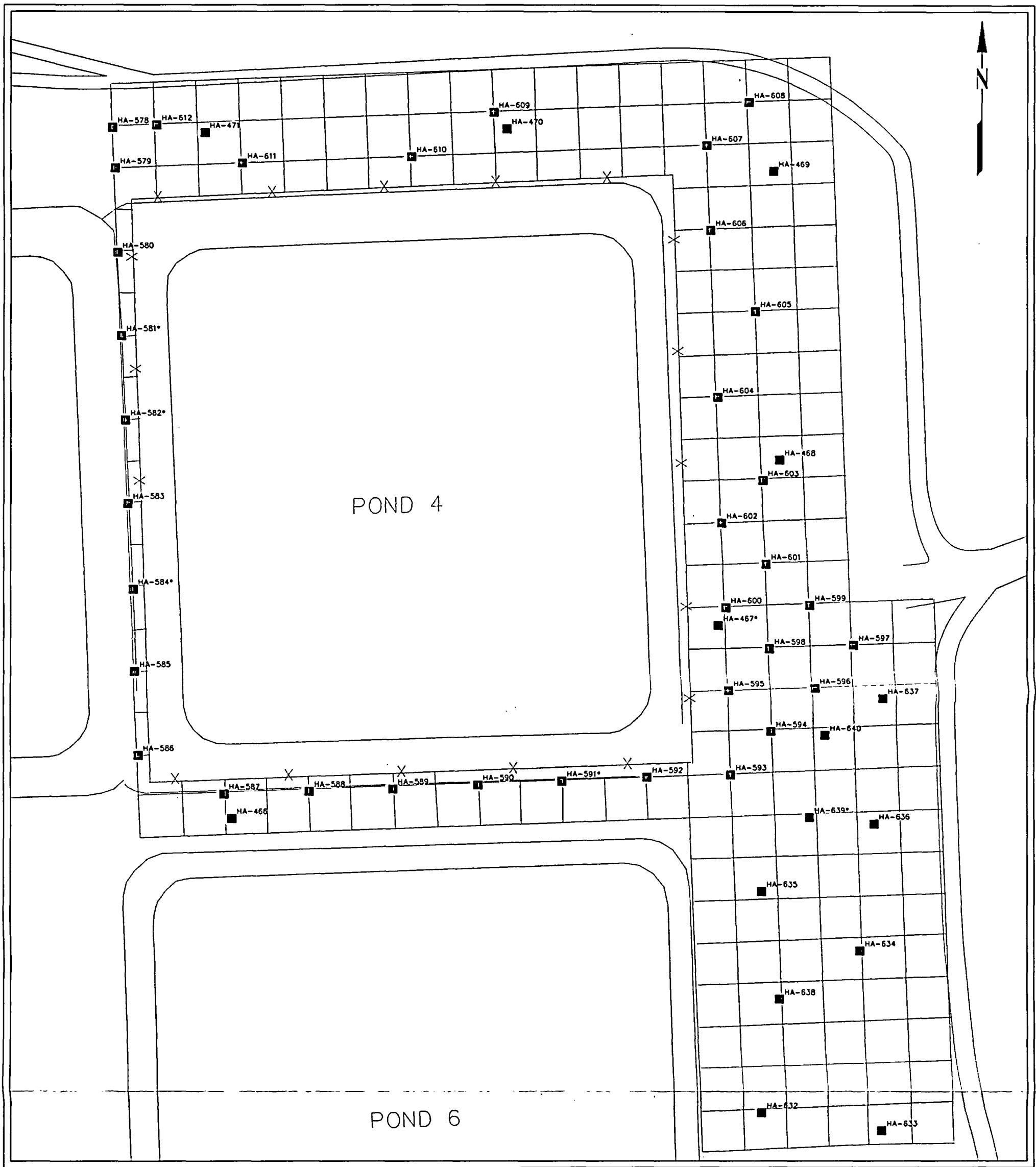


HA307 & HA308 ARE LOCATED APPROXIMATELY
12 MILES WEST OF MAIN PROCESSING PLANT.

SEQUOYAH FUELS CORPORATION	
TITLE: Location of Reference Area (Background) Soil Samples	
PREPARED BY: SFC	FILENAME: FIG 2.dwg
REVIEWED BY: RHM	FIGURE NO. 2
DATE: July 2005	



SEQUOYAH FUELS CORPORATION	
TITLE: *Location of Pond 4 Final Radiological Status Samples Inside Fence*	
PREPARED BY: *SFC*	FILENAME: *Pond4_figure3.dwg*
REVIEWED BY: *RHM*	FIGURE NO. 3
DATE: *July 2005*	



SEQUOYAH FUELS CORPORATION	
TITLE: *Location of Pond 4 Final Radiological Status Samples Outside Fence*	
PREPARED BY: *SFC*	FILENAME: *Pond4_figure4.dwg*
REVIEWED BY: *RHM*	FIGURE NO. 4
DATE: *July 2005*	

Appendix A

Radiological Status of Pond 4

A.1. INTRODUCTION

The radiological status of Pond 4 area is interpreted from historical characterization and remediation activities. The following discussions provide information about each of the characterization activities performed to date, as well as the resulting evaluation and current radiological status.

The characterization efforts were designed to identify or quantify the radiological characteristics of Pond 4 and the fertilizer loadout area, and perform an assessment of the areal and vertical extent of radioactive contamination. The key radionuclides in these characterization studies were total uranium, Th-230, and Ra-226. Affected and potentially affected soils identified by the characterization activities were subsequently remediated by excavation and transport to the Process Area.

The following subsections briefly describe the characterization and remediation activities. Tables are provided summarizing the analytical results of characterization samples. Figures are provided showing the location from which samples were collected.

A.2. STRUCTURES

There are no structures within the scope of this report.

A.3. SYSTEMS AND EQUIPMENT

There are no systems or equipment within the scope of this report.

A.4. SOURCES

The content of Pond 4 is the source that provides the potential for radioactive contamination of underlying or surrounding soils. A radiological description of this source is provided from site characterization activities and knowledge of facility operations.

Pond 4 was used to store raffinate sludge, a byproduct of the digestion step of the uranium conversion process. Samples were collected from the sludge stored in Pond 4 in 1993 and 1994. The samples were composites across the total depth of sludge at the sample location: about 15 feet. The concentration of the key radionuclides for each sample is provided in Table A-1. The location from which each sample was collected is shown in Figure A-1.

Pond 4 also included underdrains that functioned as a leak detection system. The underdrains were sampled monthly. The results of the underdrain samples are provided in Table A-2.

In 1995, the raffinate sludge that was stored in Pond 4 was transferred to the Clarifier A Basin within the Process Area. The synthetic liner was cleaned and the pond was maintained empty except for collected rainfall.

A.5. SOIL

Characterization of surface and subsurface soils was achieved by soil core sampling. Summaries of the characterization and remediation activities that involved soils and the focus of each are described below.

Pond 4 was formerly maintained as a restricted Area. The fence designating the controlled area boundary is used to divide Pond 4 into two areas for the purpose of characterization and remediation. This boundary also recognizes that the contamination outside the fence is certainly limited to surface soils.

A.5.1. Inside the fence

Radiological characterization of Pond 4 for decontamination planning consisted of several radiation surveys and soil sampling events. Initially, a radiation survey was performed of the top surface of the synthetic liner. The removable alpha and beta/gamma contamination was near background levels. The direct alpha and beta/gamma levels were up to several thousand transformations per minute per 100 cm^2 (tpm/100cm^2). A later survey of several locations on the bottom surface of the synthetic liner revealed removable alpha and beta/gamma contamination from background to several hundred tpm/100cm^2. The direct alpha and beta/gamma levels of the later survey were up to several thousand tpm/100cm^2. The liner was subsequently removed to the Process Area.

A gamma scan was completed inside the fence of Pond 4 in November 1995. The gamma scan indicated that the presence of contamination coincided with tears in the synthetic liner. The results of the gamma scan are summarized in Figure A-2.

Also in November 1995, six locations of the clay liner were sampled at 0 to 0.5 foot and 0.5 foot to 1 foot. The samples were collected without differentiating between the sand layer between the synthetic and clay liners. The sample results are provided in Table A-3. The sample locations are shown in Figure A-3.

In 1998, following removal of the synthetic liner from Pond 4, 16 locations were sampled of the bottom of Pond 4. Samples were collected of the sand layer (0.0 to 0.1 foot) between the synthetic liner and the clay liner, and of the surface 0.25 foot of the clay liner. The sample results are provided in Table A-5. The sample locations are shown in Figure A-5.

Gamma scans were completed inside Pond 4 in July and September 1998. The gamma scans coincided with minor remediation efforts. The results of the gamma scans are summarized in figures A-6 and A-7.

In 1999, a substantial portion of the clay liner was removed to the Interim Soil Storage Cell in the Process Area. Subsequently, 18 composite samples were collected of the berms, banks, bottom, and underdrains of Pond 4. Each composite sample was comprised of nine 0.0 to 0.5 foot clay plugs. The sample results are provided in Table A-6. The sample locations are shown in Figure A-8. Sample HA516 is not shown in Figure A-8; this sample is comprised of six plugs, one from each underdrain.

In 1999, after removal of a substantial portion of the clay liner, the five westernmost underdrains of Pond 4 were removed to the Process Area. Subsequently, a composite sample was collected of each underdrain trench. Each composite sample was comprised of five 0.0 to 0.5 foot clay plugs. The sample results are provided in Table A-7. The sample locations are shown in Figure A-9.

Additional characterization was completed in Fall 2003 to identify the extent of remediation required to satisfy applicable cleanup criteria. Several locations of the clay liner and soils inside the Pond 4 fence were sampled at varying depths. The sample results are provided in Table A-8. The sample locations are shown in Figure A-10. Based on the characterization results, it was determined that areas in the bottom of Pond 4 represented by samples HA-561, HA-568, and HA-569 required further remediation. Approximately 120 cubic yards of soil were removed from these areas to the Process Area.

Further characterization was completed in Summer 2004 also to identify the extent of remediation required to satisfy applicable cleanup criteria. The results of sediment sample SD-223 in August 2004 indicated the need for additional characterization and remediation of the sediment in Pond 4. The sample results are provided in Table A-9. The sample locations are shown in Figure A-11.

Samples were taken in September 2004 of the sediment that had been excavated and piled in a dry area of Pond 4, as well as of the sediment that remained that was too wet to excavate. Based on the characterization results, it was determined that three areas on the bottom of Pond 4 required further remediation: SD-247, SD-249, and SD-254. Approximately 50 cubic yards of sediment was removed from the area of SD-249 and SD-254 to the Process Area. Samples HA-665 and HA-666 confirmed remediation was effective at these areas. The sample results are provided in Table A-10. The sample locations are shown in Figure A-12.

Approximately 30 tons (40 cubic yards of flyash were brought in and mixed with the sediment in the southeast corner of Pond 4 (area of SD-247) in order to stabilize sediment and allow excavation. Subsequently, approximately 175 cubic yards of sediment/flyash mixture were removed from this area to the Process Area. Samples HA-661 through HA-664 confirmed remediation was effective at these areas. The sample results are provided in Table A-11. The sample locations are shown in Figure A-13.

Previous samples taken in the areas of HA-503 indicated levels above the cleanup criteria. Soil was removed from this area to the Process Area. The soil removed from the area of HA-503 is included in the 120 cubic yards described earlier.

After the contaminated soil was removed, additional samples were taken from the remediated areas during October 2004. The location of HA-366 was identified by gamma walkover to identify the hot spot located by the earlier gamma scan; approximately one cubic yard of soil was removed from the area of HA-366. HA-684 was taken from the area of a previous gamma scan hot spot. Samples HA-679 through HA-683 were taken from the location of previous sample HA-503; these samples were taken on the same composite pattern as the other samples in the bottom of Pond 4. The results of sampling completed in October 2004 are provided in Table A-11. The corresponding sample locations are shown in Figure A-13.

A sample exercise was completed in November 2004 following localized remediations. Excavation was completed at former sample locations HA-679 and HA-682 based on respective sample results (see Table A-11 and Figure A-13); samples HA-687 and HA-688, respectively, were collected from these two areas following excavation. Samples HA-689 and HA-690 were collected from the area of previous sample HA-684, following excavation of this area. Samples HA-685 and HA-686 were collected from the northern section of the western-most underdrain; this section of underdrain had not been excavated in 1999 with the other underdrains. The results of sampling completed in October 2004 are provided in Table A-12. The corresponding sample locations are shown in Figure A-14.

SFC believed the conditions of Pond 4 were particularly close to satisfying the cleanup criteria. In that regard, SFC implemented a comprehensive survey of the bottom of the Pond with intent of providing a complete and current description of the radiological status. The bottom of Pond 4 was divided into 10m x 10m grids. A five plug composite soil sample was collected from 25 of the grids. The results of sampling completed in November 2004 are provided in Table A-13. The corresponding sample locations are shown in Figure A-15.

In January 2005 a gamma scan was completed of the bottom of Pond 4. The results of the gamma scan are summarized in Figure A-16.

The composite sampling of November 2005 identified two grids that exceeded the cleanup criteria: HA-700 and HA-705. Soils in and around these grids were removed to the Process Area. The areas were resampled in March 2005 as HA-725 and HA-726. An additional remediation and sampling was completed at grid HA-726 in May 2005 as HA-727. The results of sampling are provided in Table A-14 and the corresponding sample locations are shown in figures A-17 and A-18.

In late May 2005, NRC Region IV completed an inspection at the SFC site. The scope of the inspection included a review of activities and conditions at Pond 4. The inspection also included radiation surveys and soil sampling at Pond 4. The inspector identified locations for collection of soil samples. SFC personnel collected the samples and split the samples with the NRC personnel. The results of sampling are provided in Table A-14 and the corresponding sample locations are shown in Figure A-19.

A.5.2. Outside the fence

In 1991, prolonged steady wind dried a portion of the raffinate sludge in Pond 4. Subsequently, the wind carried some of the dried material and deposited dust along the south fenceline, the roadway between Pond 4 and Pond 6, and on the east side of ponds 4 and 6. Surface soil, rock, vegetation, and debris were removed to the Process Area and subsequently to the Interim Soil Storage Cell.

In 1996, four surface boreholes were drilled along the north and east sides of Pond 4. Soil samples were collected of the top two feet of surface soil at each borehole. The sample results are provided in Table A-4. The sample locations are shown in Figure A-4.

In 1997, seven samples were collected of surface soil on the north, east, and south sides of Pond 4. The sample locations were chosen based on knowledge of the 1991 contamination previously described, and the results of the gamma scan survey of these soils completed in 1996. Samples were collected of the top 0.5 foot of surface soil at each location. The sample results are provided in Table A-4. The sample locations and the results of the gamma scan are shown in Figure A-4.

Sample HA-467 indicated levels above the cleanup criteria. Soil was removed from this area to the Process Area; approximately 20 cubic yards were removed from the area of HA-467.

After the contaminated soil was removed, HA678 was collected from the area of previous sample HA-467. The results of sampling completed in October 2004 are provided in Table A-11. The corresponding sample locations are shown in Figure A-13.

Additional characterization was completed in Fall 2003 to identify the extent of remediation required to satisfy applicable cleanup criteria. Several locations of the soils outside the Pond 4 fence were sampled at varying depths. The sample results are provided in Table A-8. The sample locations are shown in Figure A-10. Based on the characterization results, it was determined that the top of the berm between ponds 4 and 3E, and two locations outside the southeast corner of Pond 4 required further remediation. Several cubic yards of soil were removed from these areas to the Process Area. The original sample exercise showed the contamination was limited to the surface soils, therefore no sampling was completed after remediation.

A.6. SURFACE WATER

There are no surface water bodies directly within the scope of this final status survey plan. Surface water bodies at the facility are described in the Site Characterization Report[1] (SCR) and/or are subject to ongoing monitoring activities[2].

A.7. GROUNDWATER

The groundwater underlying the fertilizer pond area is not within the scope of this final status survey plan. The groundwater at the facility is described in the SCR and is subject to ongoing monitoring activities[3].

[1] Sequoyah Fuels Corporation, "Reclamation Plan", January 2003, Appendix D "Site Characterization Report".
[2] U.S. Nuclear Regulatory Commission. Source Material License SUB-1010, Sequoyah Fuels Corporation, Docket 40-8027. Chapter 5.

[3] U.S. Nuclear Regulatory Commission. Source Material License SUB-1010, Sequoyah Fuels Corporation, Docket 40-8027. Chapter 5.

Table A-1, Analytical Results of 1993 and 1994 Pond 4 Sludge Samples

		Sample Depth (ft)		Radionuclide Concentration		
Date	Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
1993						
	SD-180	0.00	15.00	4560	5420	189
	SD-181	0.00	15.00	3780	5450	174
	SD-182	0.00	15.00	3900	5440	177
	SD-183*	--	--	3006	4690	152
1994						
	SD-001	0.00	15.00	7010	nr	nr
	SD-002	0.00	15.00	6810	nr	nr
	SD-003	0.00	15.00	6740	nr	nr
	SD-004	0.00	15.00	7640	nr	nr

[Figure A-1]

nr: No result available for this radionuclide.

* A composite sample developed from SD180 through SD182.

Table A-2, Average of Analytical Results of Samples of Underdrains

		Radionuclide Concentration		
Date	Location ID	U-nat ug/l	Th-230 pCi/l	Ra-226 pCi/l
1991 - 1998	Pond 4	6	na	1

na: No analysis performed for this radionuclide.

Table A-3, Analytical Results of Samples of November 1995 Clay Samples

	Sample Depth (ft)		Radionuclide Concentration		
			U-nat	Th-230	Ra-226
Location ID	Top	Bottom	ug/g	pCi/g	pCi/g
HA-456	0.00	0.50	1	1	1
	0.50	1.00	1		
HA-457	0.00	0.50	1	2	1
	0.50	1.00	1		
HA-458	0.00	0.50	1	2	1
	0.50	1.00	1		
HA-459	0.00	0.50	1	1	1
	0.50	1.00	1		
HA-460	0.00	0.50	15	111	3
	0.50	1.00	7		
HA-461	0.00	0.50	4	3	0
	0.50	1.00	1	na	na

[Figure A-3]
na: No analysis performed for this radionuclide.

Table A-4, Analytical Results of 1996 Pond 4 Boreholes and 1997 Gamma Scan Soil Samples

		Sample Depth (ft)		Radionuclide Concentration		
Date	Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
1996 Boreholes						
	BH-313	0.00	2.00	<1	na	na
	BH-314	0.00	2.00	<1	na	na
	BH-315	0.00	2.00	<1	na	na
	BH-316	0.00	2.00	<1	na	na
1997 Gamma Scan						
	HA-366	0.00	0.50	5	1	5
	HA-466	0.00	0.50	3	3	1
	HA-467	0.00	0.50	11	72	3
	HA-468	0.00	0.50	5	1	1
	HA-469	0.00	0.50	2	2	1
	HA-470	0.00	0.50	4	2	1
	HA-471	0.00	0.50	4	1	1

[Figure A-4]

na: No analysis performed for this radionuclide.

Table A-5, Analytical Results of Samples of June 1998 Sand and Clay Samples

	Sample Depth (ft)		Radionuclide Concentration		
Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
HA-485 sand	0.00	0.10	6	0	na
clay	0.00	0.25	8	0	na
HA-486 sand	0.00	0.10	7	1	na
clay	0.00	0.25	8	0	na
HA-487 sand	0.00	0.10	9	0	na
clay	0.00	0.25	6	0	na
HA-488 sand	0.00	0.10	6	8	na
clay	0.00	0.25	4	0	na
HA-489 sand	0.00	0.10	7	16	na
clay	0.00	0.25	5	1	na
HA-490 sand	0.00	0.10	6	34	na
clay	0.00	0.25	7	1	na
HA-491 sand	0.00	0.10	10	0	na
clay	0.00	0.25	6	0	na
HA-492 sand	0.00	0.10	7	3	na
clay	0.00	0.25	5	0	na
HA-493 sand	0.00	0.10	8	0	na
clay	0.00	0.25	5	0	na
HA-494 sand	0.00	0.10	5	5	na
clay	0.00	0.25	9	3	na
HA-495 sand	0.00	0.10	19	89	na
clay	0.00	0.25	11	1	na
HA-496 sand	0.00	0.10	57	206	na
clay	0.00	0.25	10	10	na
HA-497 sand	0.00	0.10	5	0	na
clay	0.00	0.25	11	0	na
HA-498 sand	0.00	0.10	4	0	na
clay	0.00	0.25	7	0	na
HA-499 clay	0.00	0.25	7	0	na
HA-500 mix	0.00	0.10	13	2	na

[Figure A-5]
na: No analysis performed for this radionuclide.

Table A-6, Analytical Results of 1999 Clay Composite Samples

	Sample Depth (ft)		Radionuclide Concentration		
Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
HA-503	0.00	0.50	10	33	2
HA-504	0.00	0.50	5	13	2
HA-505	0.00	0.50	8	40	3
HA-506	0.00	0.50	6	15	1
HA-507	0.00	0.50	7	17	2
HA-508	0.00	0.50	7	21	3
HA-509	0.00	0.50	11	33	3
HA-510	0.00	0.50	11	42	2
HA-511	0.00	0.50	10	24	2
HA-512	0.00	0.50	4	1	1
HA-513	0.00	0.50	5	2	2
HA-514	0.00	0.50	4	1	1
HA-515	0.00	0.50	5	3	2
HA-516*	0.00	0.50	11	51	3
HA-517	0.00	0.50	6	8	2
HA-518	0.00	0.50	9	21	2
HA-519	0.00	0.50	5	1	1
HA-520	0.00	0.50	5	5	2

[Figure A-8]

na: No analysis performed for this radionuclide.

* A composite of six plugs, one from each underdrain.

Table A-7, Analytical Results of 1999 Underdrain Composite Clay Samples

	Sample Depth (ft)		Radionuclide Concentration		
Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
HA-521	0.00	0.50	11.0	19.0	1.5
HA-522	0.00	0.50	5.0	22.0	2.1
HA-523	0.00	0.50	3.9	16.0	1.5
HA-524	0.00	0.50	6.5	8.0	1.6
HA-525	0.00	0.50	7.3	22.0	2.2

[Figure A-9]
na: No analysis performed for this radionuclide.

Table A-8, Analytical Results of September October 2003 Soil and Clay Samples

Date	Location ID	Sample Depth (ft) Top	Bottom	Radionuclide Concentration U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
September - October 2003						
	inside fence					
	HA-560	0.00	0.50	2	14	1
	HA-561	0.00	0.50	16	102	3
		0.50	1.00	3	9	1
	HA-562	0.00	0.50	7	24	2
	HA-563	0.25	0.75	1	0	1
	HA-564	1.00	1.50	2	3	0
	HA-565	0.50	1.00	1	2	3
	HA-566	0.75	1.25	3	20	1
	HA-567	0.50	1.00	2	6	1
	HA-568	1.00	1.50	7	39	1
		1.50	2.00	3	5	1
	HA-569	1.00	1.50	10	82	5
		1.50	2.00	5	22	1
	HA-570	1.50	2.00	8	25	2
	HA-571	2.00	2.50	1	1	1
	HA-572	2.00	2.50	5	14	2
	HA-573	1.50	2.00	3	22	3
	HA-574	0.00	0.50	3	0	1
	HA-575	0.00	0.50	3	0	1
	HA-576	0.00	0.50	3	0	1
	HA-577	0.00	0.50	2	2	1
	HA-631	0.00	0.50	3	0	1
	outside fence					
	HA-578	0.00	0.50	4	0	1
	HA-579	0.00	0.50	3	0	1
	HA-580	0.00	0.50	7	0	2
	HA-581	0.00	0.50	11	37	2
		0.50	1.00	3	0	1
	HA-582	0.00	0.50	8	40	1
		0.50	1.00	4	0	1
	HA-583	0.00	0.50	4	2	1
	HA-584	0.00	0.50	8	29	1
		0.50	1.00	3	2	1
	HA-585	0.00	0.50	4	6	1
	HA-586	0.00	0.50	3	0	1
	HA-587	0.00	0.50	3	0	1
	HA-588	0.00	0.50	3	3	2
	HA-589	0.00	0.50	4	7	1
	HA-590	0.00	0.50	3	0	1

Table A-8, Analytical Results of September October 2003 Soil and Clay Samples

		Sample Depth (ft)		Radionuclide Concentration		
Date	Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
	HA-591	0.00	0.50	6	19	2
		0.50	1.00	3	2	1
	HA-592	0.00	0.50	4	3	1
	HA-593	0.00	0.50	4	3	1
	HA-594	0.00	0.50	2	0	1
	HA-595	0.00	0.50	4	2	1
	HA-596	0.00	0.50	3	1	1
	HA-597	0.00	0.50	3	0	1
	HA-598	0.00	0.50	4	1	1
	HA-599	0.00	0.50	3	1	3
	HA-600	0.00	0.50	5	2	1
	HA-601	0.00	0.50	4	1	1
	HA-602	0.00	0.50	4	0	3
	HA-603	0.00	0.50	5	1	1
	HA-604	0.00	0.50	13	0	1
	HA-605	0.00	0.50	5	0	1
	HA-606	0.00	0.50	6	0	1
	HA-607	0.00	0.50	10	2	1
	HA-608	0.00	0.50	6	0	2
	HA-609	0.00	0.50	5	0	1
	HA-610	0.00	0.50	5	0	1
	HA-611	0.00	0.50	5	2	1
	HA-612	0.00	0.50	4	0	1
	HA-632	0.00	0.50	4	0	1
	HA-633	0.00	0.50	4	0	1
	HA-634	0.00	0.50	3	1	1
	HA-635	0.00	0.50	3	1	1
	HA-636	0.00	0.50	3	1	1
	HA-637	0.00	0.50	4	0	1
	HA-638	0.00	0.50	3	0	1
	HA-639	0.00	0.50	3	15	1
		0.50	1.00	3	2	1
	HA-640	0.00	0.50	3	4	1

[Figure A-10]

Table A-9, Analytical Results of August 2004 Sediment and Clay Samples

	Sample Depth (ft)		Radionuclide Concentration		
Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
HA-653	0.00	0.50	2	1	1
HA-654	0.00	0.50	2	1	1
HA-655	0.00	0.50	2	1	1
HA-656	0.00	0.50	1	1	1
HA-657	0.00	0.50	2	1	1
HA-658	0.00	0.30	2	6	1
HA-659	0.00	0.50	2	0	1
HA-660	0.00	0.50	2	2	1
SD-223	sediment grab		8	51	2

[Figure A-11]

Table A-10, Analytical Results of September 2004 Sediment Samples

	Sample Depth (ft)		Radionuclide Concentration		
Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
SD-244	sediment grab		5	13	2
SD-245	sediment grab		6	31	2
SD-246	sediment grab		6	25	3
SD-247	sediment grab		10	80	4
SD-248	sediment grab		6	25	2
SD-249	sediment grab		4	69	3
SD-250	sediment grab		4	27	2
SD-251	sediment grab		6	35	3
SD-252	sediment grab		5	31	2
SD-253	sediment grab		5	34	2
SD-254	sediment grab		7	41	3
SD-255	sediment grab		5	22	1

[Figure A-12]

Table A-11, Analytical Results of September October 2004 Soil and Clay Samples

		Sample Depth (ft)		Radionuclide Concentration		
Date	Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
September 2004						
	HA-661	0.00	0.50	2	1	1
	HA-662	0.00	0.50	3	2	1
	HA-663	0.00	0.50	3	1	1
	HA-664	0.00	0.50	4	2	1
	HA-665	0.00	0.50	7	27	1
	HA-666	0.00	0.50	5	1	7
October 2004						
outside fence						
	HA-678	0.00	0.33	7	3	1
inside fence						
	HA-679	0.00	0.50	12	72	3
	HA-680	0.00	0.50	4	11	1
	HA-681	0.00	0.50	3	3	1
	HA-682	0.00	0.50	13	71	5
	HA-683	0.00	0.50	3	2	1
	HA-684	0.00	0.50	147	859	37
		0.50	1.00	157	806	34

[Figure A-13]

Table A-12, Analytical Results of November 2004 Soil and Clay Samples

	Sample Depth (ft)		Radionuclide Concentration		
Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
HA-685	0.00	0.50	3	1	1
HA-686	0.00	0.50	3	1	1
HA-687	0.00	0.50	3	1	1
HA-688	0.00	0.50	3	4	1
HA-689	0.00	0.50	3	1	0
HA-690	0.00	0.50	3	6	1

[Figure A-14]

Table A-13, Analytical Results of December 2004 Composite Samples

	Sample Depth (ft)		Radionuclide Concentration		
Location ID*	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
HA-691	0.00	0.50	6	22	2
HA-692	0.00	0.50	6	22	2
HA-693	0.00	0.50	6	26	2
HA-694	0.00	0.50	6	15	2
HA-695	0.00	0.50	4	2	1
HA-696	0.00	0.50	5	17	1
HA-697	0.00	0.50	7	24	2
HA-698	0.00	0.50	7	23	2
HA-699	0.00	0.50	5	15	1
HA-700	0.00	0.50	15	86	4
HA-701	0.00	0.50	4	5	2
HA-702	0.00	0.50	4	5	1
HA-703	0.00	0.50	6	15	1
HA-704	0.00	0.50	4	2	2
HA-705	0.00	0.50	6	19	2
HA-706	0.00	0.50	3	10	1
HA-707	0.00	0.50	4	8	1
HA-708	0.00	0.50	3	6	1
HA-709	0.00	0.50	7	30	2
HA-710	0.00	0.50	6	28	2
HA-711	0.00	0.50	7	25	2
HA-712	0.00	0.50	6	24	2
HA-713	0.00	0.50	7	29	2
HA-714	0.00	0.50	7	24	2
HA-715	0.00	0.50	6	27	2

[Figure A-15]

* The samples were composites of five plugs evenly spaced within a 10m x 10m square.

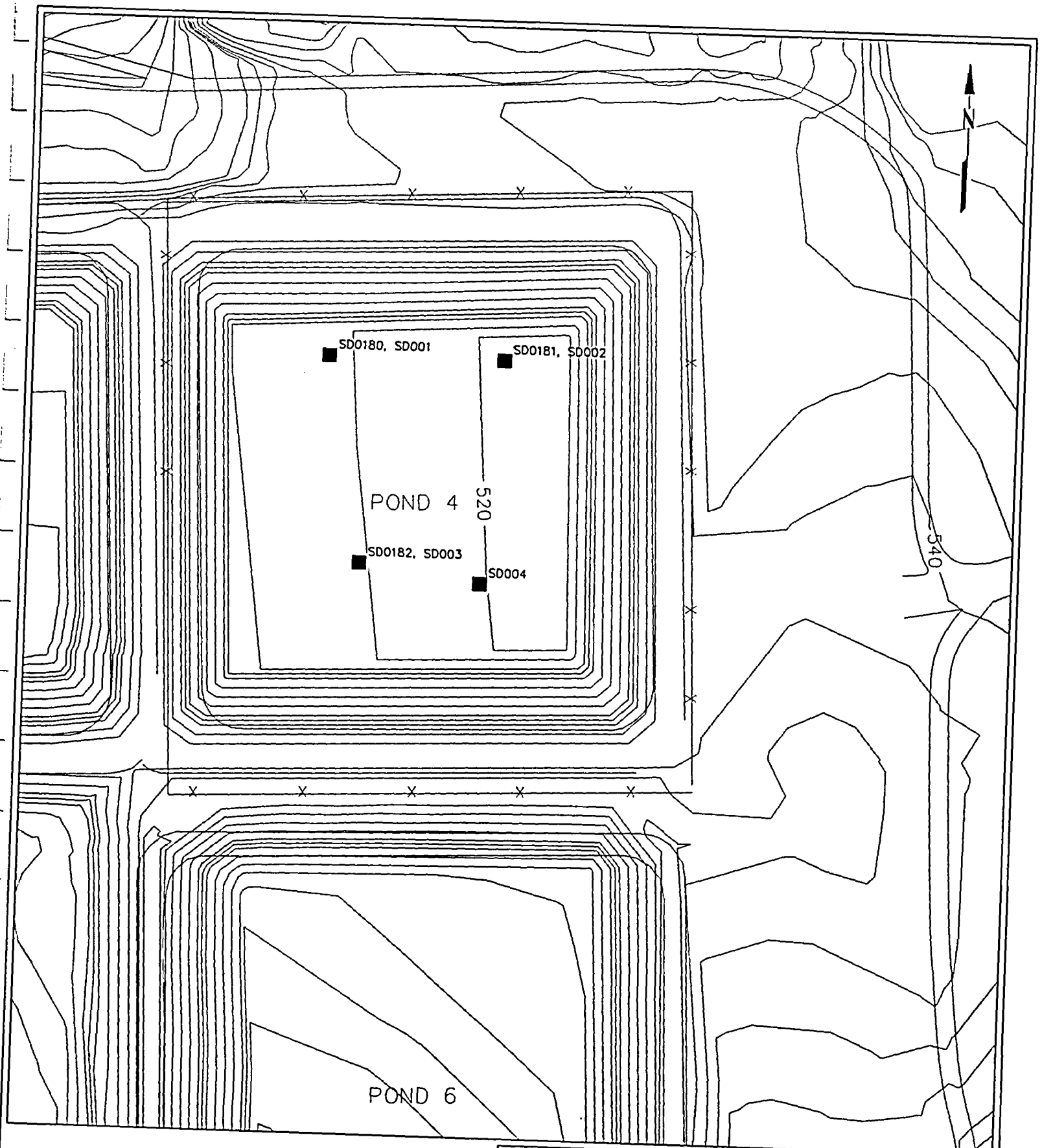
Table A-14, Analytical Results of March May 2005 Composite Samples and Samples Split with NRC

		Sample Depth (ft)		Radionuclide Concentration		
Date	Location ID	Top	Bottom	U-nat ug/g	Th-230 pCi/g	Ra-226 pCi/g
March 2005						
	HA-725*	0.00	0.50	5	14	1
	HA-726*	0.00	0.50	7	43	2
May 2005						
	HA-727*	0.00	0.50	4	15	1
May 2005						
	HA-728#	0.00	0.50	5	20	1
	HA-729#	0.00	0.50	6	25	2
	HA-730#	0.00	0.50	4	10	2
	HA-731#	0.00	0.50	5	21	2

[Figures A-17, A-18, and A-19]

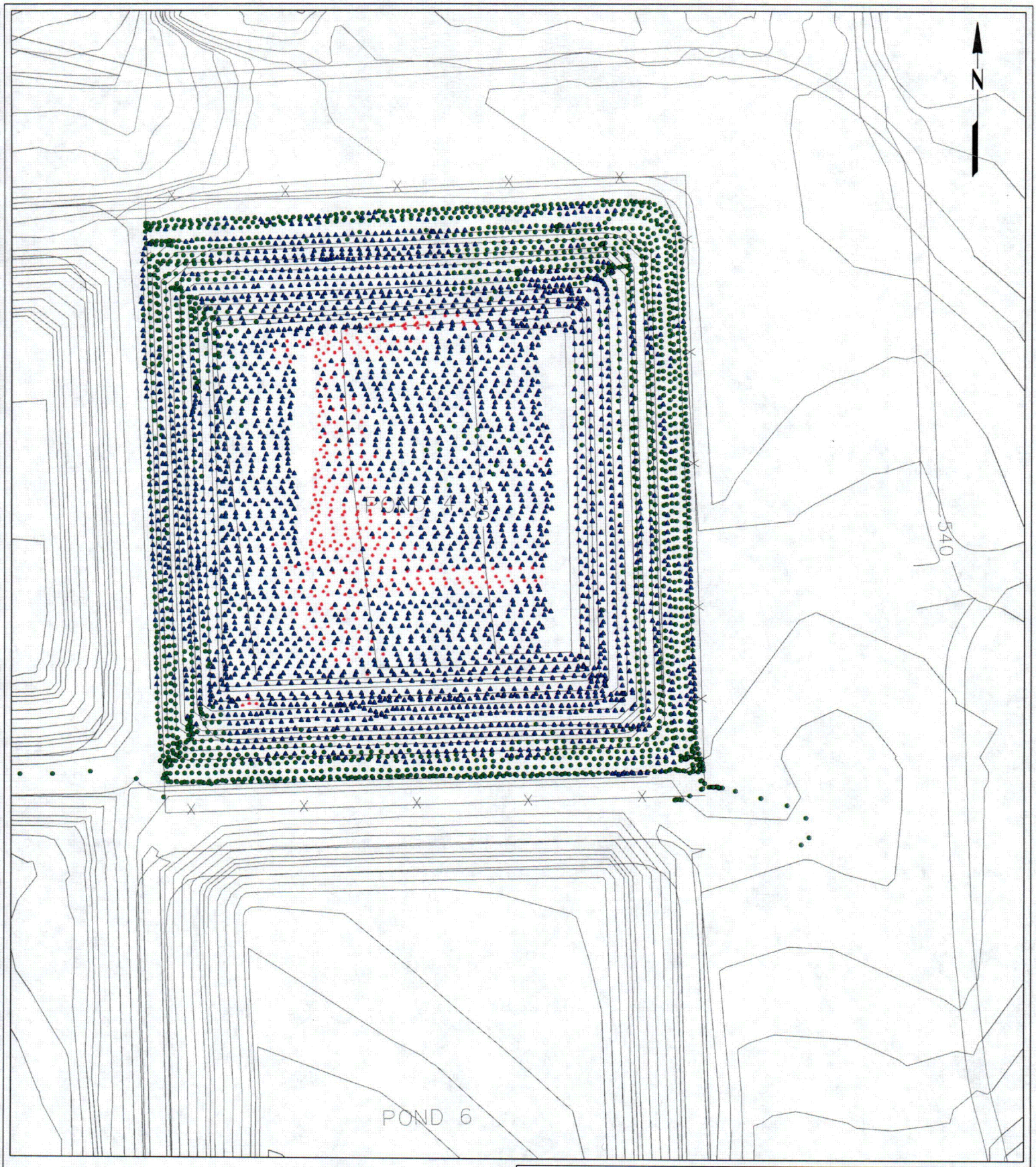
* The sample was a composite of five plugs evenly spaced within a 10m x 10m square.

The sample was a five plug composite and was split with NRC at time of collection.



* Location of SD0183, a composite of SD0180 through SD0182, is not shown.

SEQUOYAH FUELS CORPORATION	
TITLE: Location of 1993 and 1994 Pond 4 Sludge Samples	
PREPARED BY: SFC	FILENAME: Pond4_A1.dwg
REVIEWED BY: RHM	FIGURE NO. A-1
DATE: July 2005	



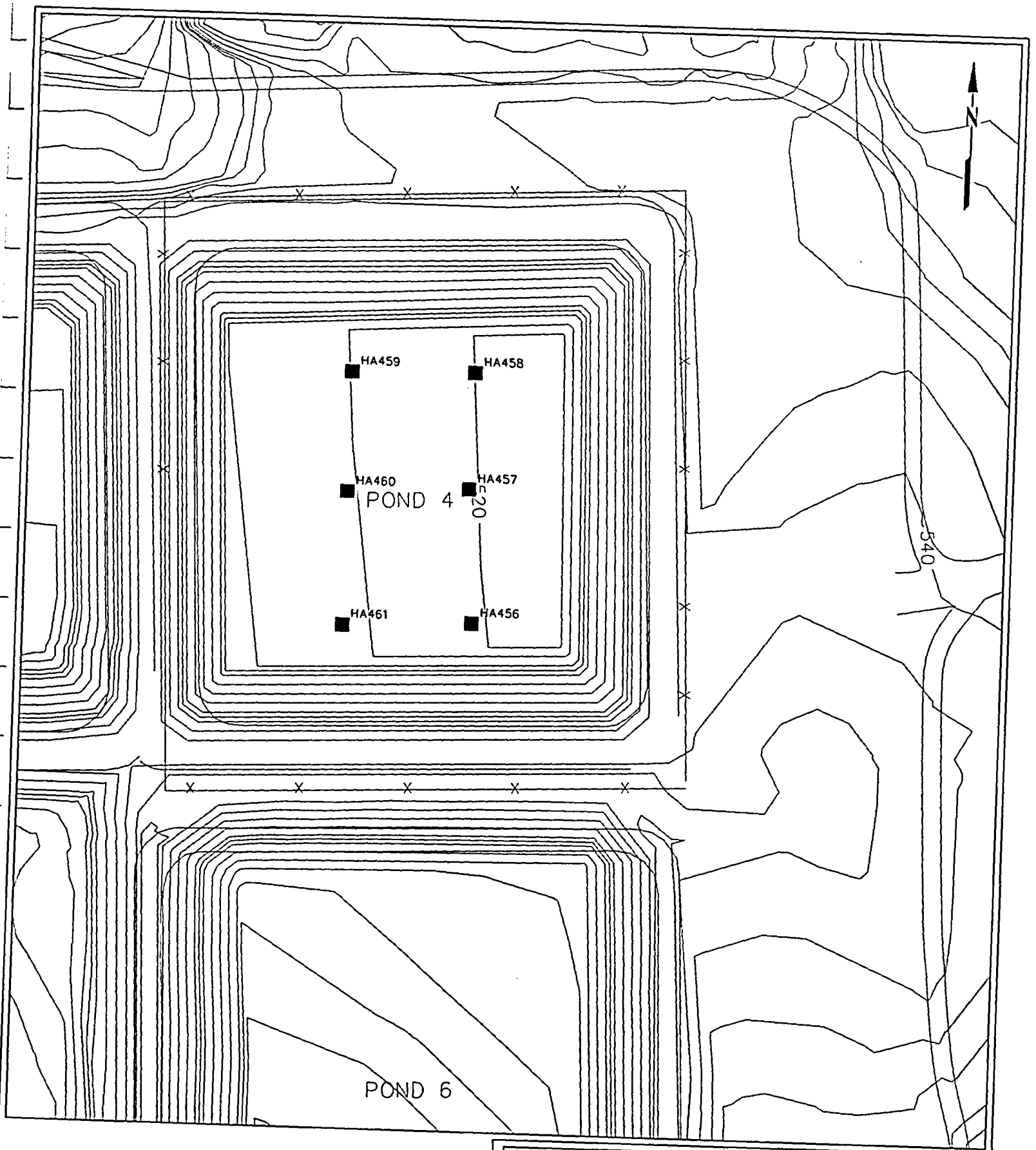
Legend

- 0 to 13032 : cpm ≤ baseline
- 13032 to 39096 : baseline < cpm ≤ 3x baseline
- 39096 to Max : 3x baseline < cpm

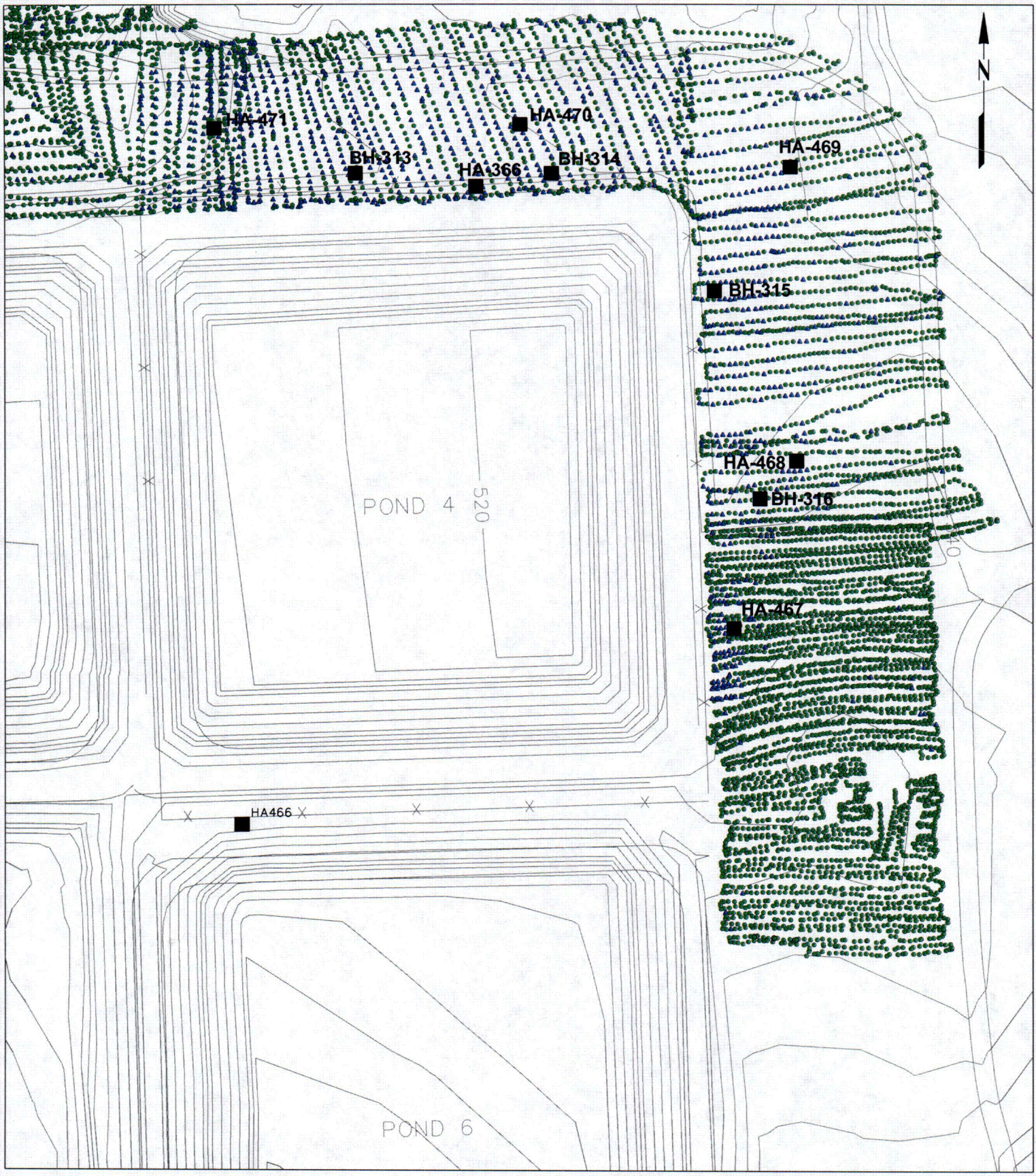
SEQUOYAH FUELS CORPORATION

TITLE: *Gamma Scan November 1995*	
PREPARED BY: *SFC*	FILENAME: *Pond4_A2.dwg*
REVIEWED BY: *RHM*	FIGURE NO. A-2
DATE: *July 2005*	

C02



SEQUOYAH FUELS CORPORATION	
TITLE: Location of November 1995 Clay Samples	
PREPARED BY: SFC	FILENAME: Pond4_A3.dwg
REVIEWED BY: RHM	FIGURE NO. A-3
DATE: July 2005	



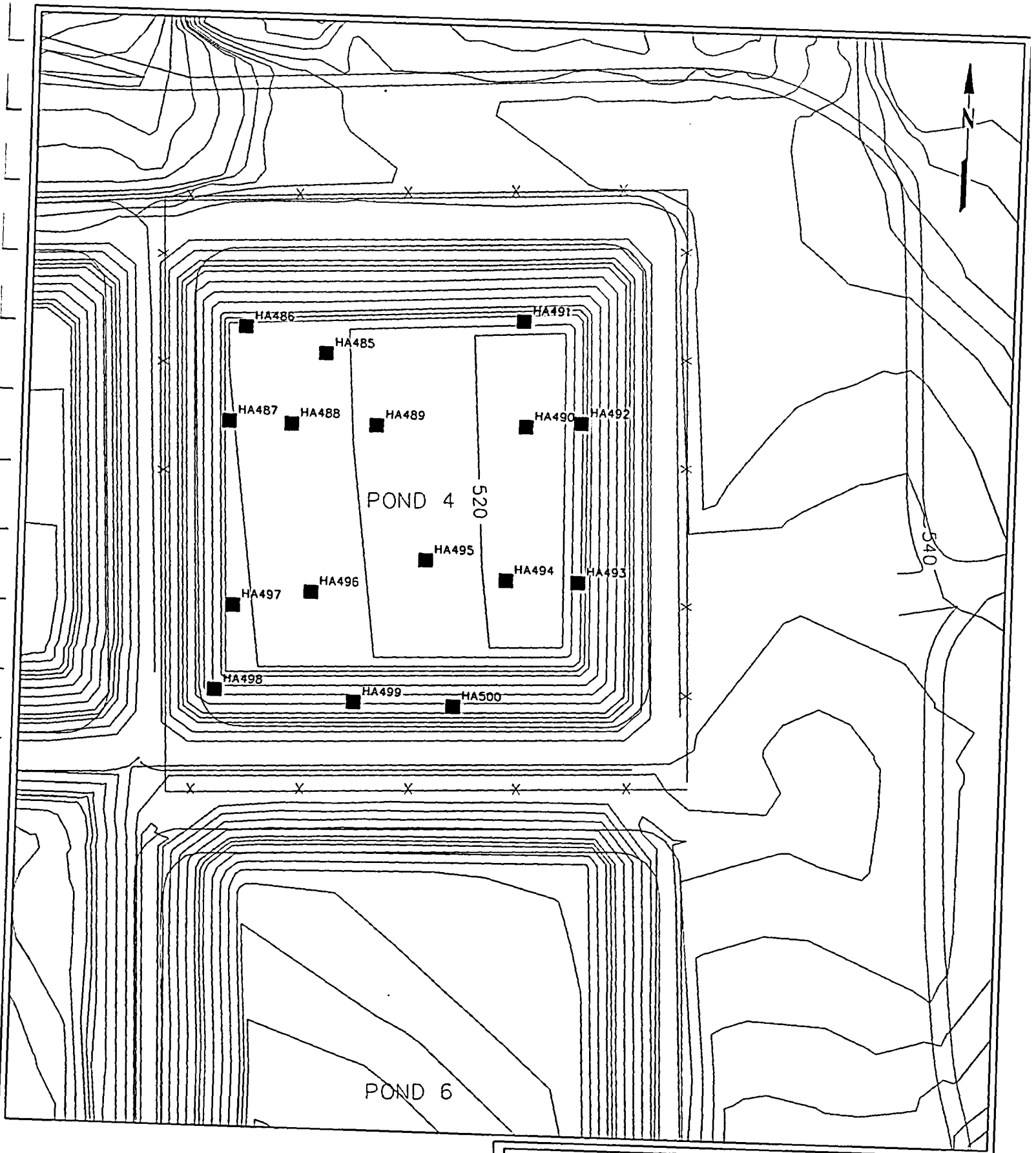
Legend

- 0 to 13032 : cpm ≤ baseline
- 13032 to 39096 : baseline < cpm ≤ 3x baseline

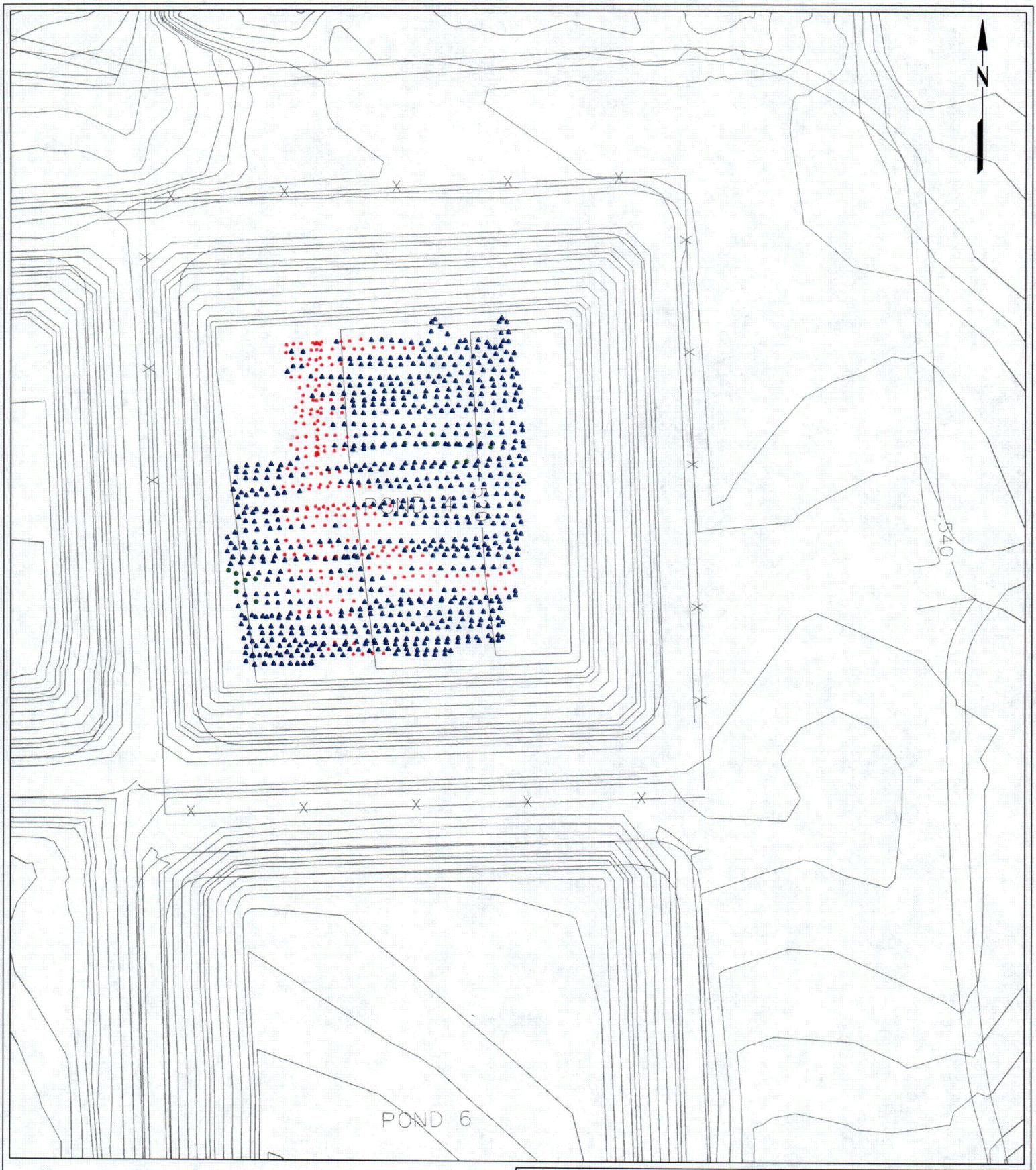
SEQUOYAH FUELS CORPORATION

TITLE:	*Gamma Scan 1997, and Location of 1996 Boreholes & 1997 Gamma Scan Samples*		
PREPARED BY:	*SFC*	FILENAME:	*Pond4_A4.dwg*
REVIEWED BY:	*RHM*		FIGURE NO. A-4
DATE:	*July 2005*		

C03



SEQUOYAH FUELS CORPORATION	
TITLE: Location of June 1998 Sand and Clay Samples	
PREPARED BY: SFC	FILENAME: Pond4_A5.dwg
REVIEWED BY: RHM	FIGURE NO. A-5
DATE: July 2005	



Legend

- 0 to 13032 : cpm ≤ baseline
- 13032 to 39096 : baseline < cpm ≥ 3x baseline
- 39096 to Max : 3x baseline < cpm

SEQUOYAH FUELS CORPORATION

TITLE: *Gamma Scan of July 1998*	
PREPARED BY: *SFC*	FILENAME: *Pond4_A6.dwg*
REVIEWED BY: *RHM*	FIGURE NO. A-6
DATE: *July 2005*	

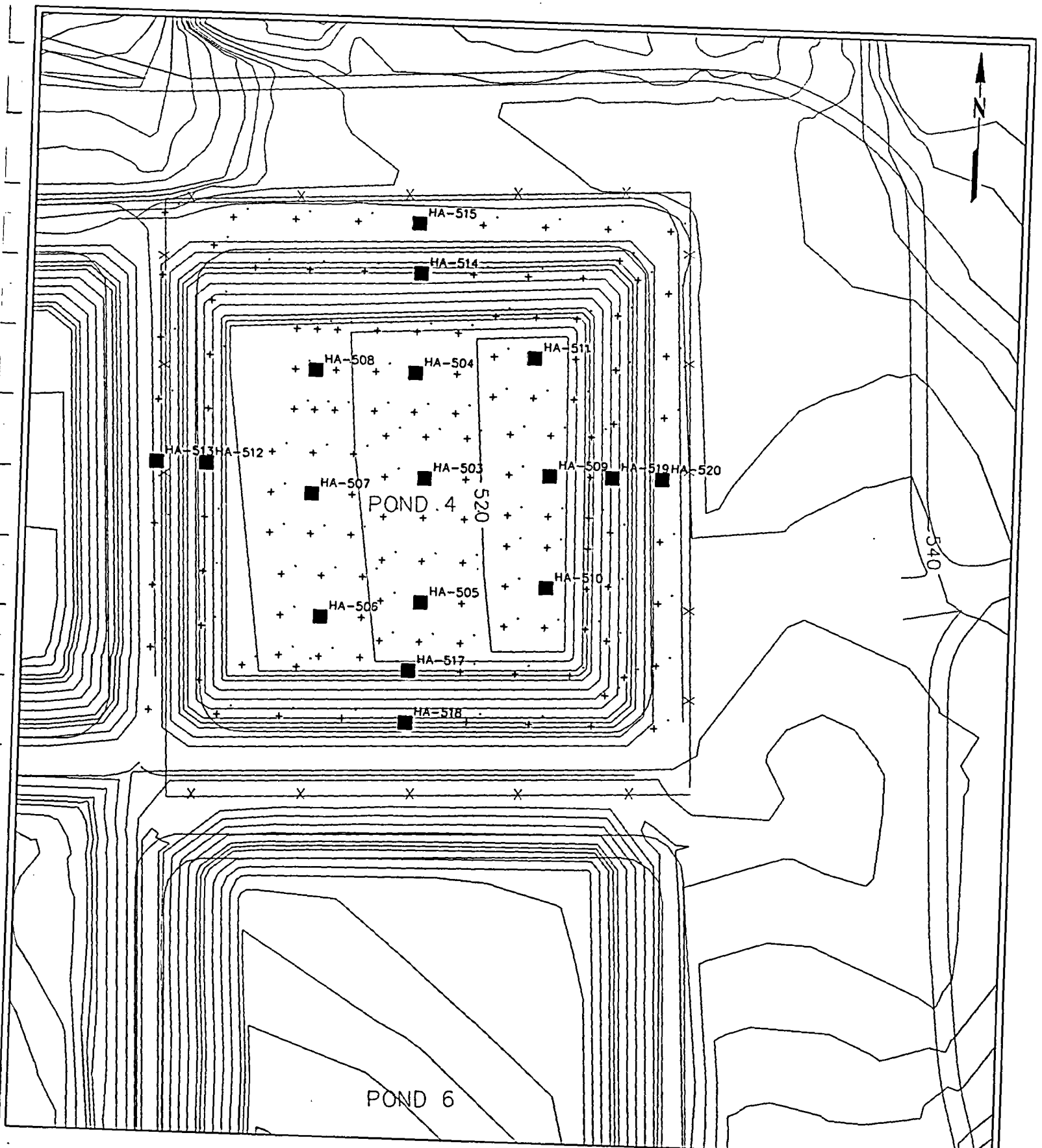
C04

Legend

- 0 to 13032 : cpm ≤ baseline
- 13032 to 39096 : baseline < cpm ≥ 3x baseline
- 39096 to Max : 3x baseline < cpm

SEQUOYAH FUELS CORPORATION	
TITLE: Gamma Scan September 1998	
PREPARED BY: SFC	FILENAME: Pond4_A7.dwg
REVIEWED BY: RHM	FIGURE NO. A-7
DATE: July 2005	

C05

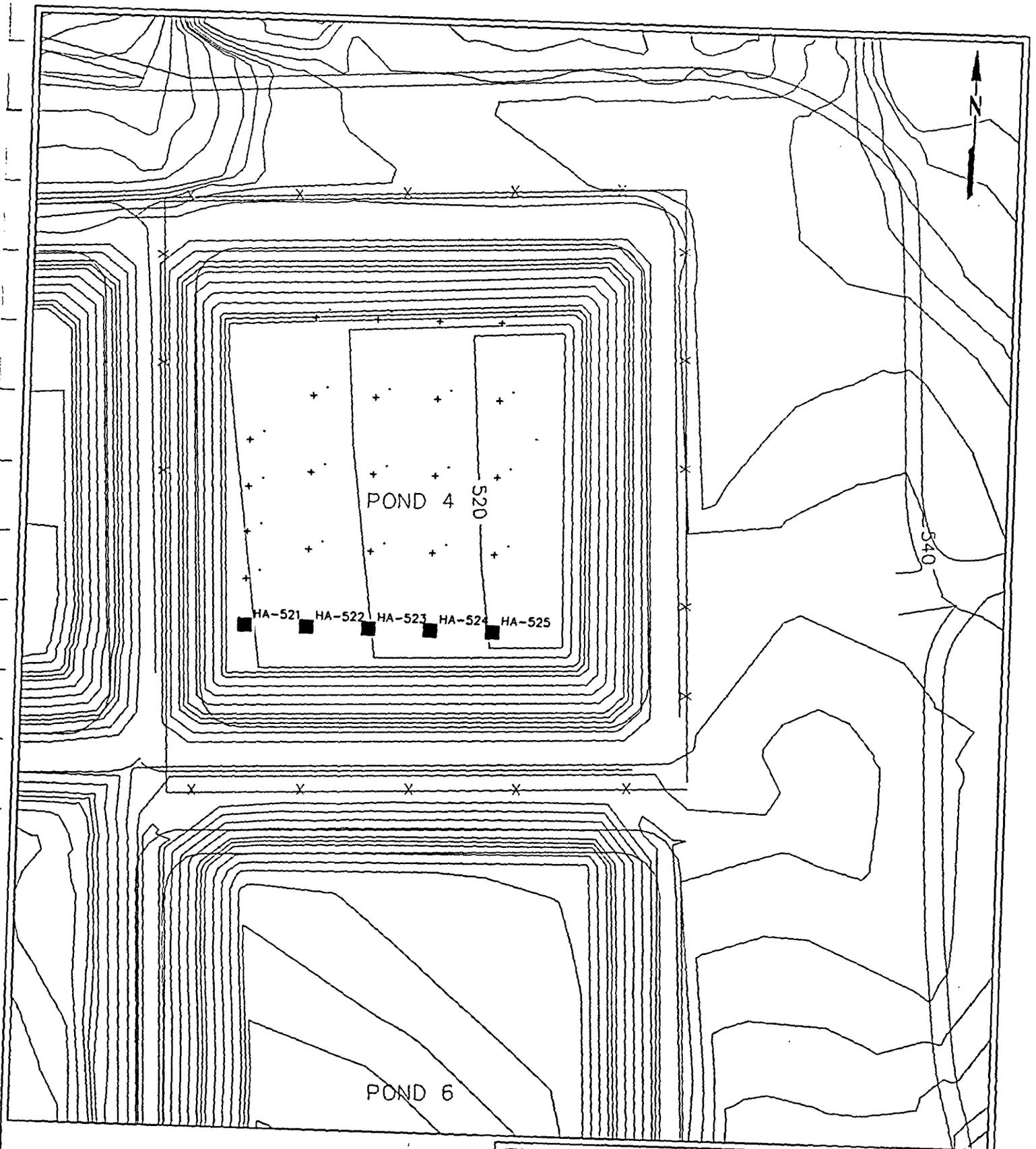


Legend

■ Center plug of composite sample.

\+ One of eight other plugs forming a composite sample.

SEQUOYAH FUELS CORPORATION	
TITLE: *Location of 1999 Clay Composite Samples*	
PREPARED BY: *SFC*	FILENAME: *Pond4_A8.dwg*
REVIEWED BY: *RHM*	FIGURE NO. A-8
DATE: *July 2005*	

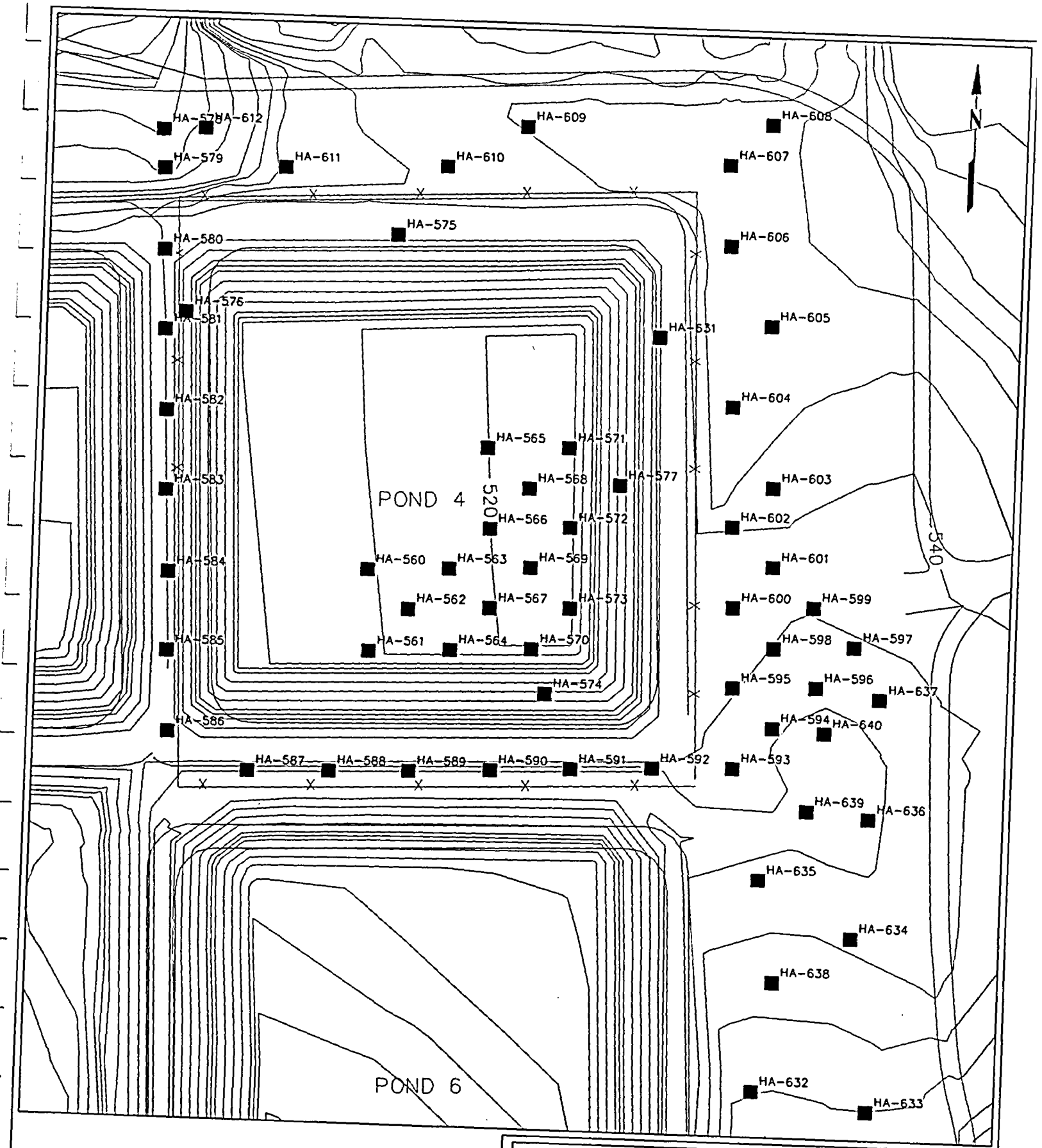


Legend

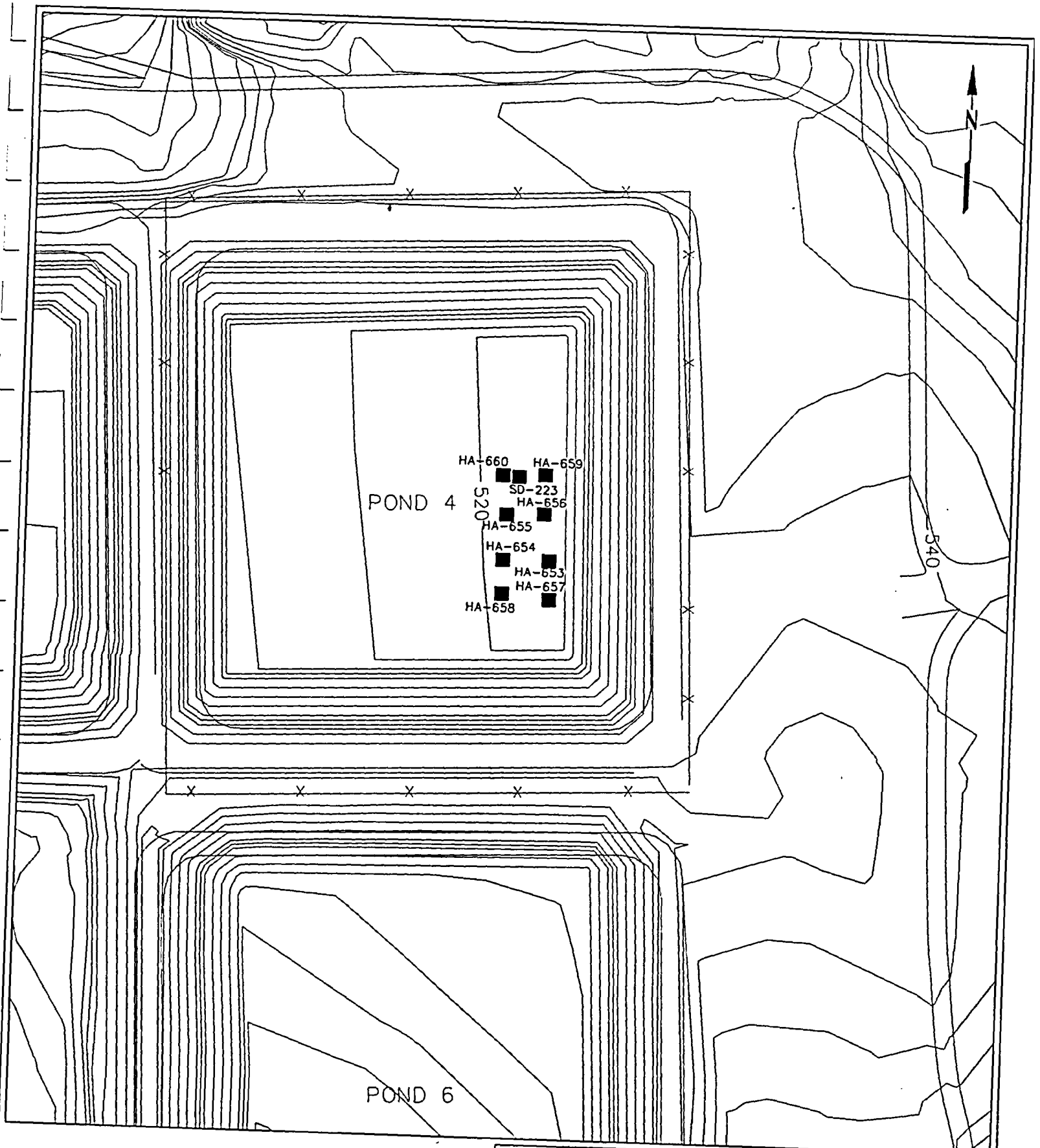
■ End plug of composite sample.

\+ One of four other plugs forming a composite sample.

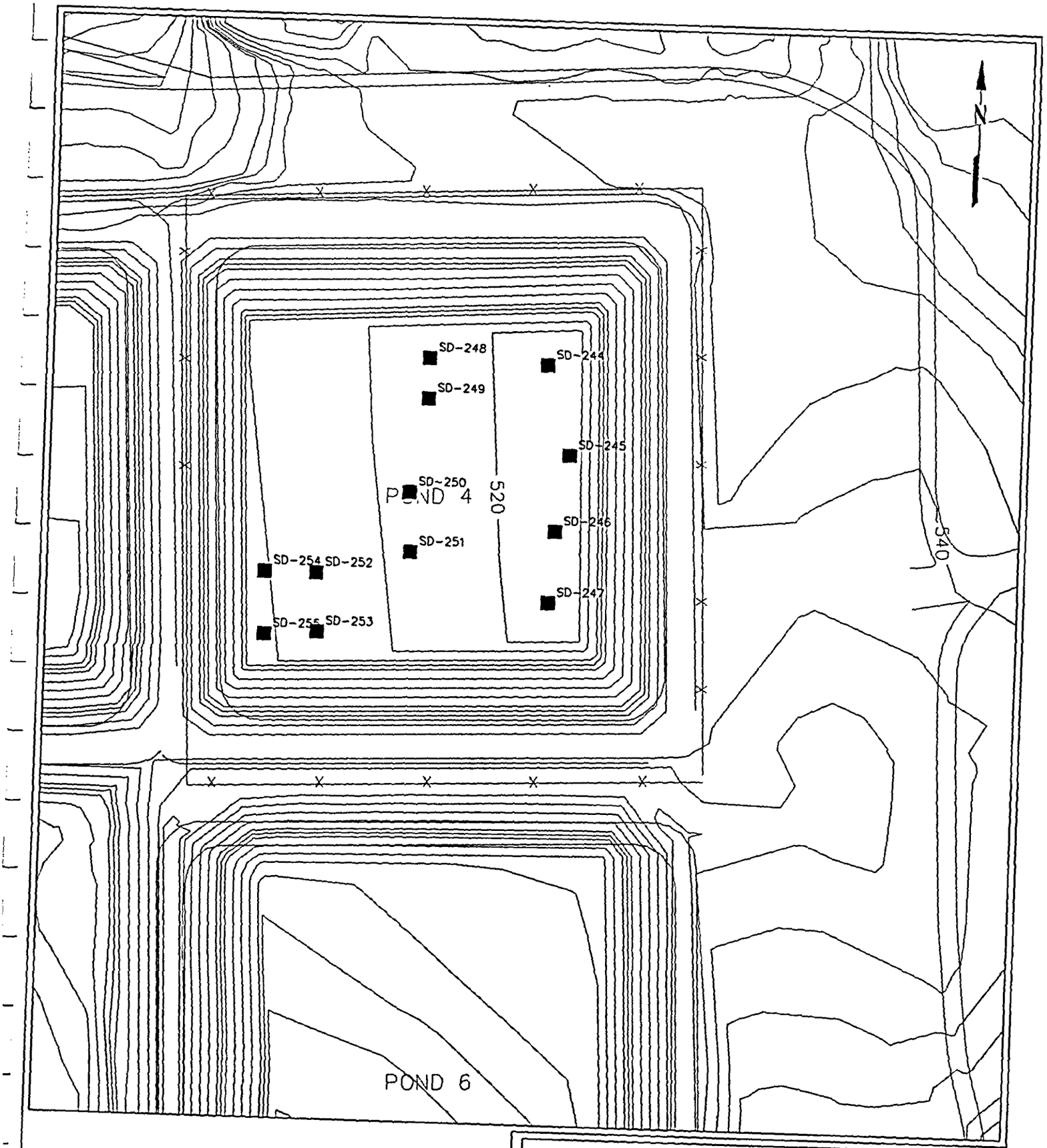
SEQUOYAH FUELS CORPORATION	
TITLE: *Location of 1999 Underdrain Clay Composite Samples*	
PREPARED BY: *SFC*	FILENAME: *Pond4_A9.dwg*
REVIEWED BY: *RHM*	FIGURE NO. A-9
DATE: *July 2005*	



SEQUOYAH FUELS CORPORATION	
TITLE: Location of Sep-Oct 2003 Soil and Clay Samples	
PREPARED BY: SFC	FILENAME: Pond4_A10.dwg
REVIEWED BY: RHM	FIGURE NO. A-10
DATE: July 2005	



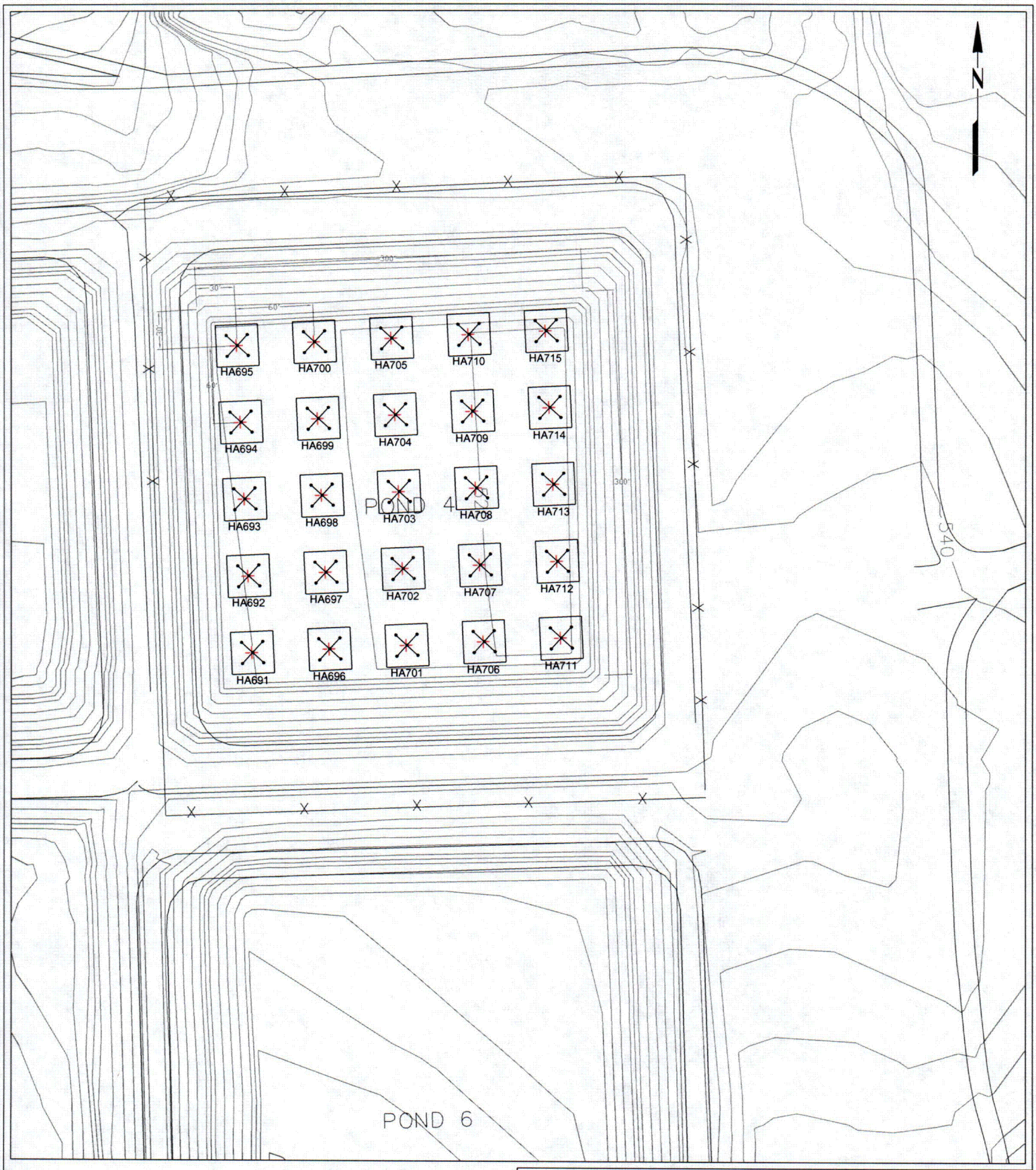
SEQUOYAH FUELS CORPORATION	
TITLE: Location of Aug 2004 Sediment and Clay Samples	
PREPARED BY: SFC	FILENAME: Pond4_A11.dwg
REVIEWED BY: RHM	FIGURE NO. A-11
DATE: July 2005	



SEQUOYAH FUELS CORPORATION	
TITLE: Location of September 2004 Sediment Samples	
PREPARED BY: SFC	FILENAME: Pond4_A12.dwg
REVIEWED BY: RHM	FIGURE NO. A-12
DATE: July 2005	

SEQUOYAH FUELS CORPORATION	
TITLE: Location of September and October 2004 Soil and Clay Samples	
PREPARED BY: SFC	FILENAME: Pond4_A13.dwg
REVIEWED BY: RHM	FIGURE NO. A-13
DATE: July 2005	

SEQUOYAH FUELS CORPORATION	
TITLE: Location of 2004 Soil and Clay Samples	
PREPARED BY: SFC	FILENAME: Pond4_A14.dwg
REVIEWED BY: RHM	FIGURE NO. A-14
DATE: July 2005	



10 m

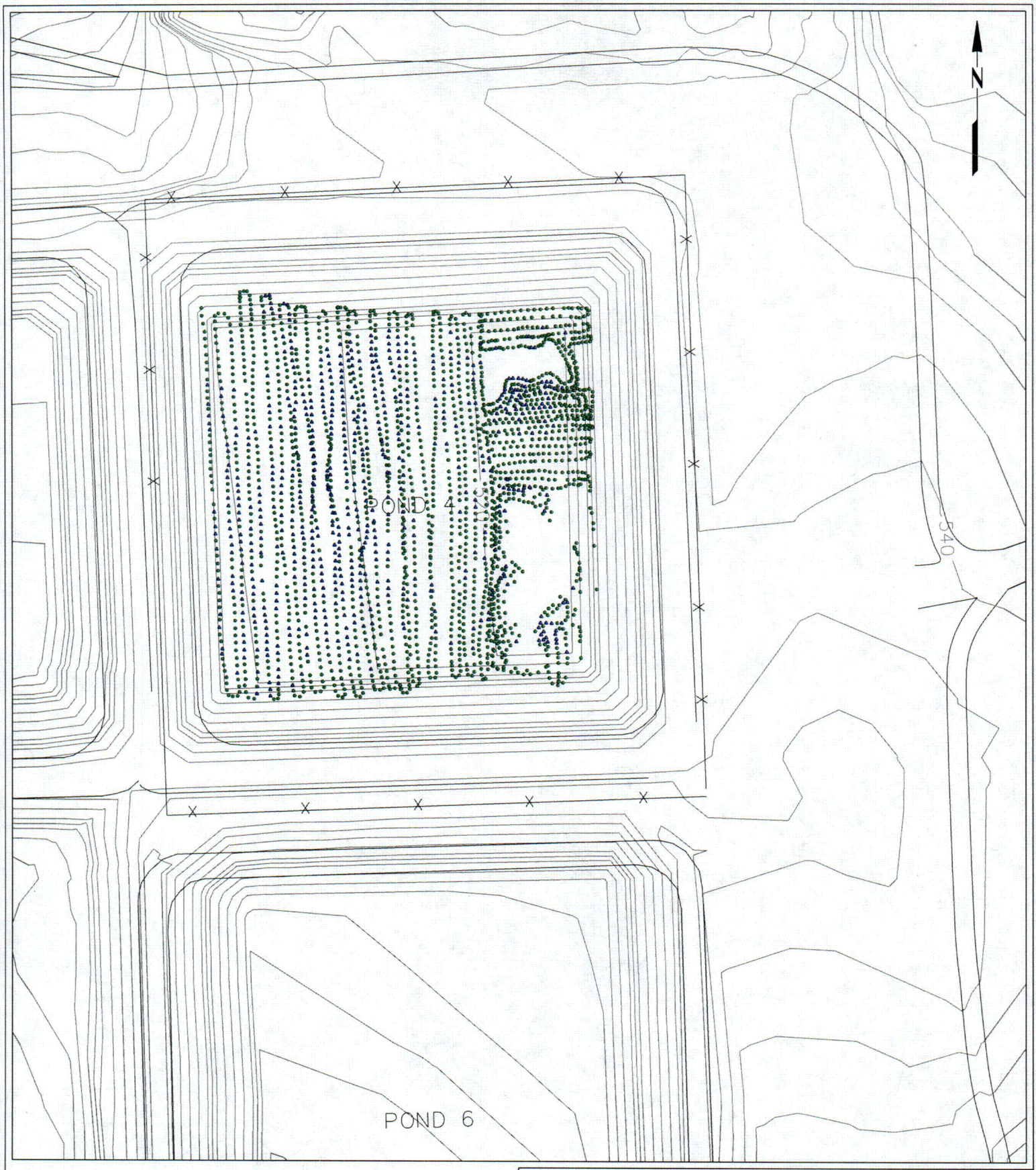
10 m

Composite Sample Pattern

● Sample Plug

SEQUOYAH FUELS CORPORATION	
TITLE: Location of December 2004 Composite Samples	
PREPARED BY: SFC	FILENAME: Pond4_A15.dwg
REVIEWED BY: RHM	FIGURE NO. A-15
DATE: July 2005	

C06

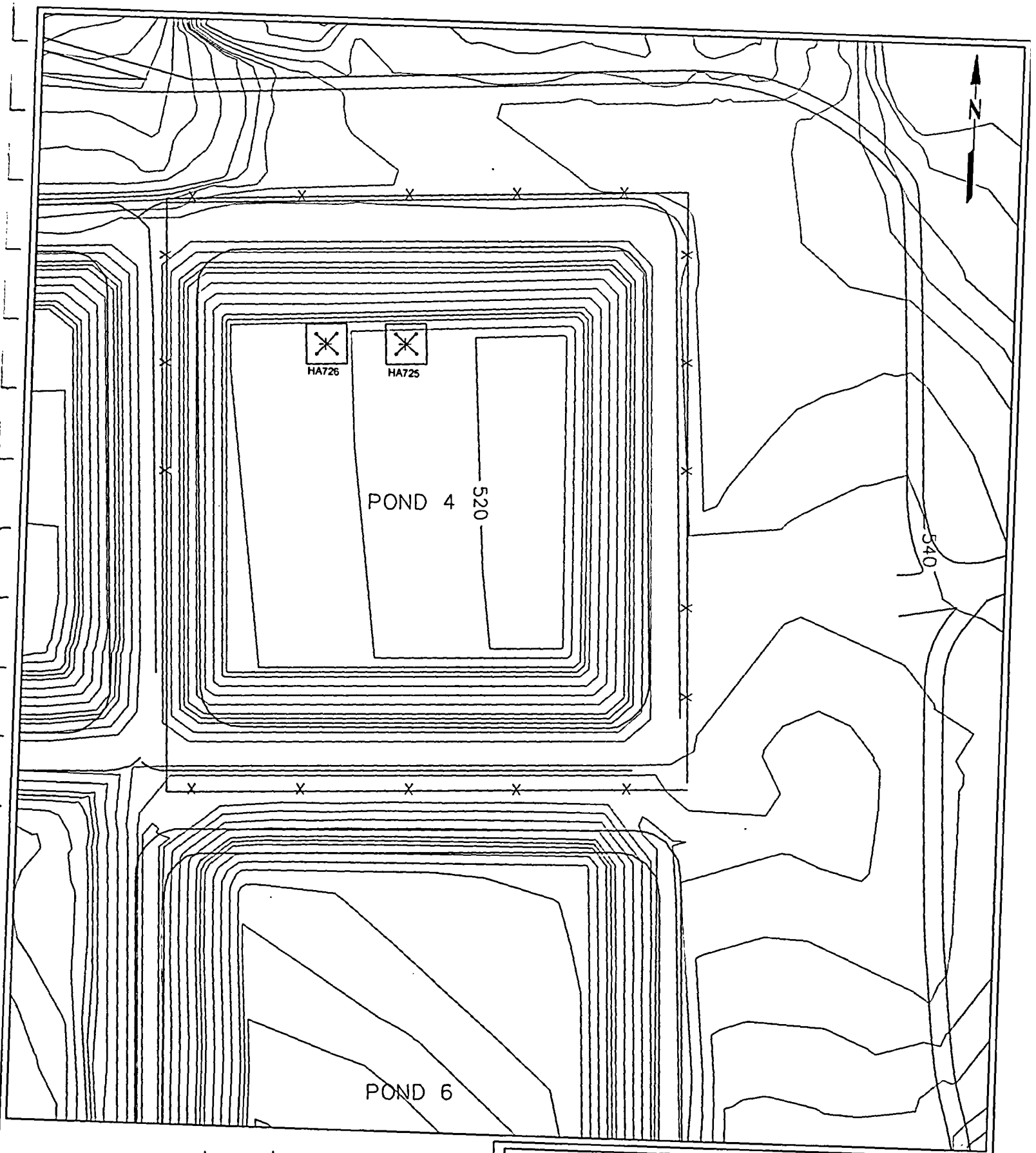


Legend

- 0 to 13032 : cpm ≤ baseline
- 13032 to 39096 : baseline < cpm ≤ 3x baseline

SEQUOYAH FUELS CORPORATION	
TITLE: *Gamma Scan January 2005*	
PREPARED BY: *SFC*	FILENAME: *Pond4_A16.dwg*
REVIEWED BY: *RHM*	FIGURE NO. A-16
DATE: *July 2005*	

C07



10 m

10 m

Composite Sample Pattern

• Sample Plug

SEQUOYAH FUELS CORPORATION

TITLE: Location of March 2005 Composite Samples

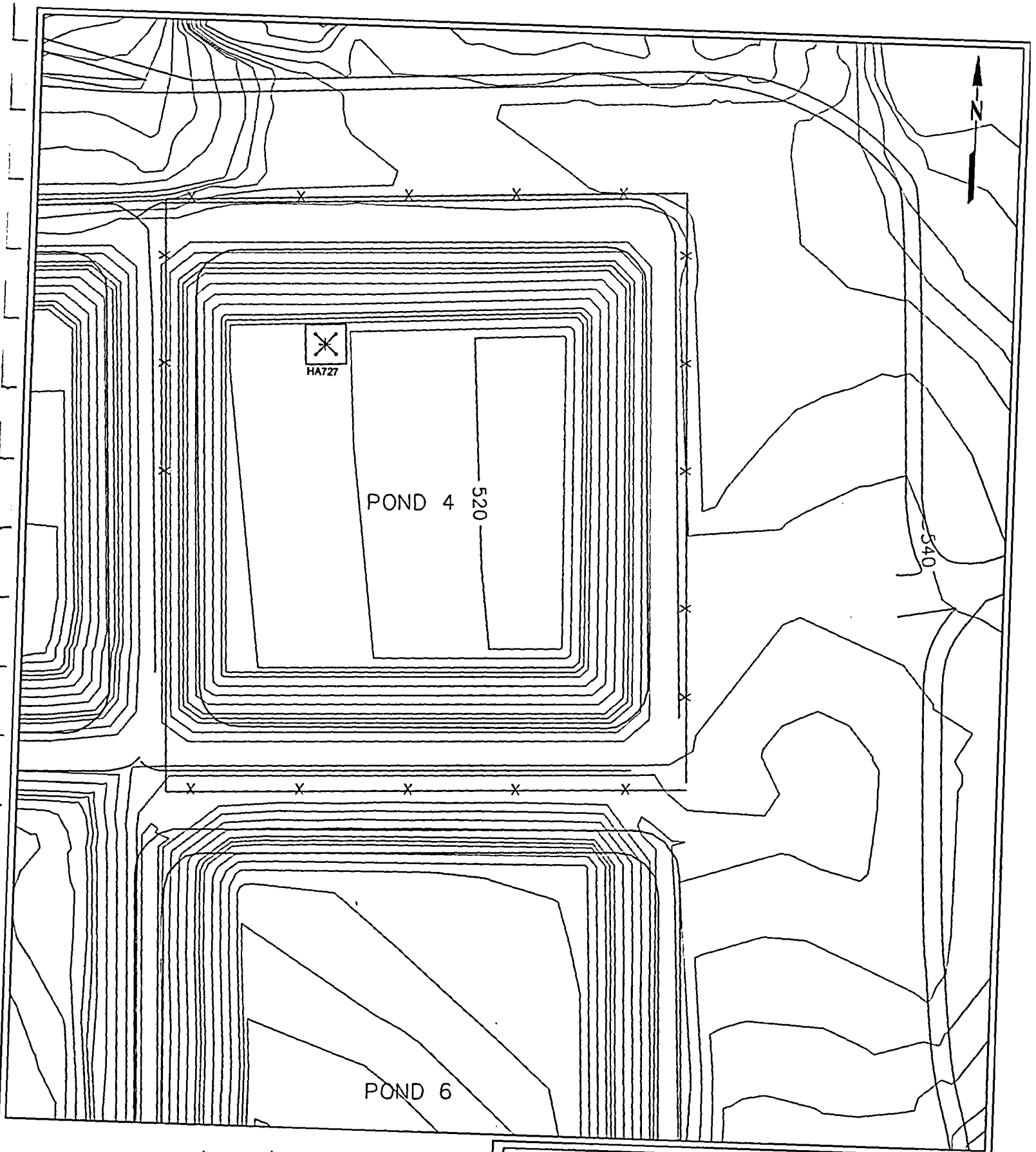
PREPARED BY: SFC

FILENAME: Pond4_A17.dwg

REVIEWED BY: RHM

DATE: July 2005

FIGURE NO. A-17



10 m
10 m
Composite Sample Pattern

• Sample Plug

SEQUOYAH FUELS CORPORATION

TITLE: Location of May 2005 Composite Samples

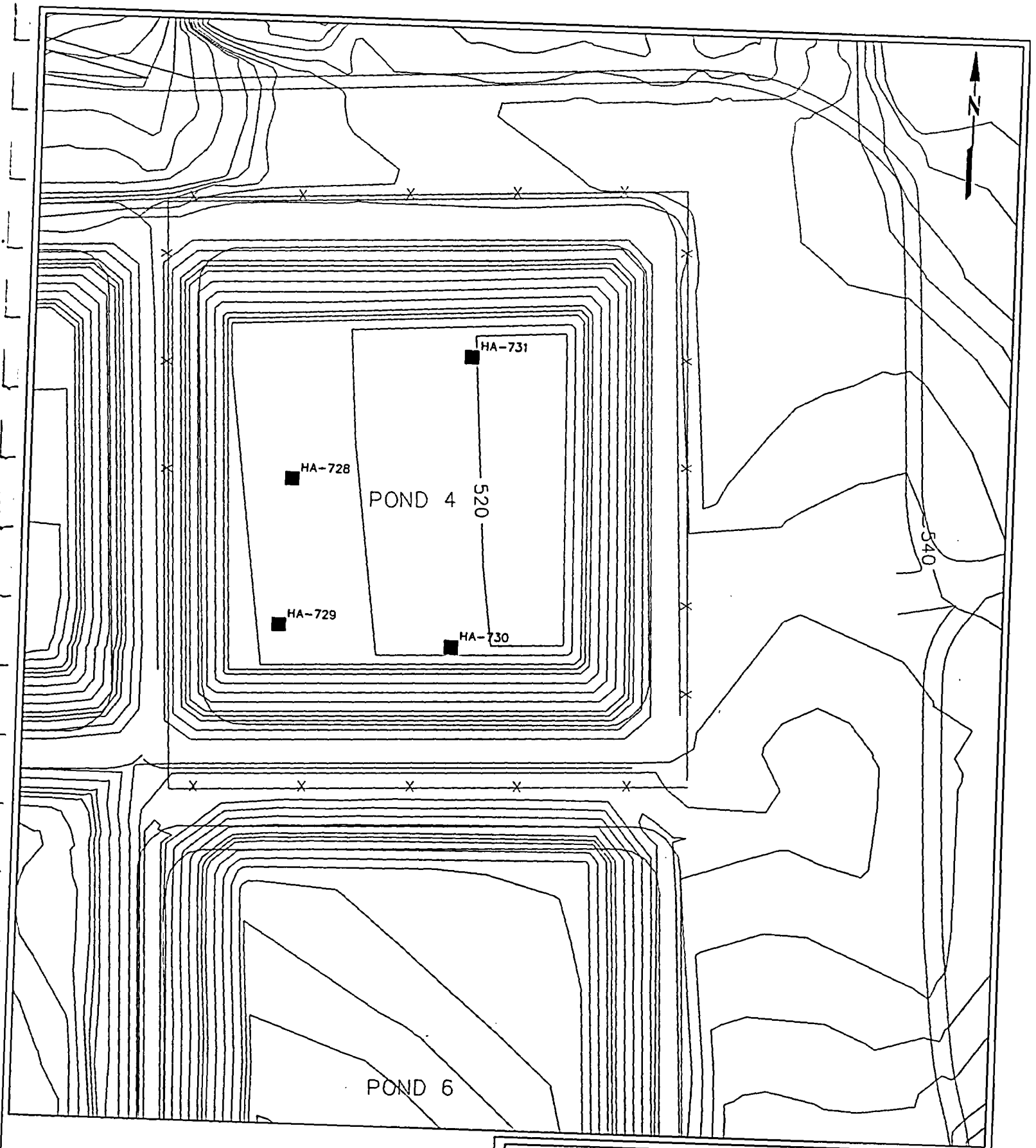
PREPARED BY: SFC

FILENAME: Pond4_A18.dwg

REVIEWED BY: RHM

DATE: July 2005

FIGURE NO. A-18



SEQUOYAH FUELS CORPORATION	
TITLE: Location of May 2005 Clay Samples Split with NRC	
PREPARED BY: SFC	FILENAME: Pond4_A19.dwg
REVIEWED BY: RHM	FIGURE NO. A-19
DATE: July 2005	