Pratt & Whitney
A United Technologies Company

400 Main Street
MS: 101-29
East Hartford, Connecticut 06108

Q-5

February 18, 2013

Licensing Assistance Team
Division of Nuclear Material Safety
U.S. Nuclear Regulatory Commission (NRC), Region 1 DNMS
2100 Renaissance Blvd. Suite 100
King of Prussia, PA 19406

Subject: Decommissioning and Final Radiological Status Report for Pratt & Whitney Middletown, CT Facility.

Ref:
1. License No. SMB-151 - Expiration Date: 01/31/2021
2. Docket No. 04000791
3. Control No. 577929 (Ref.) RLJ

To: Elizabeth Ullrich,

Enclosed is the Final Decommissioning and Radiological Status Report for Pratt & Whitney Middletown, CT Facility in response to the decommissioning plan approved by the NRC on August 6, 2012.

Pratt & Whitney respectfully requests that the NRC review the enclosed report and approve the removal of the Pratt & Whitney Middletown facility from license SMB-151.

Please contact the Pratt & Whitney, East Hartford Radiation Safety Officer, Sandy Soucy at 860-565-5561 with any comments or questions.

Sincerely,

L. Renée Welsh
Director EH&S & Facilities-MCO

Enclosure: Decommissioning and Final Radiological Status Report (Building 10) and attachments A thru H.

580086

Pratt & Whitney
Middletown, Connecticut Site

Building 10 Decommissioning and Final Radiological Status Report

Radiation Safety Associates, Inc.

February 19, 2013

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EXECUTIVE SUMMARY

A combined scoping survey/final radiological status survey was performed on the Middletown Building 10 slab. The slab was divided into ten survey units (SU). This survey was designed to meet all of the MARSSIM requirements as far as acceptable release guidelines, number of samples and measurements, etc.

The only radioisotope listed on the license is Th-232, but it would have been cost prohibitive to analyze each sample for this specific isotope. It was therefore decided to assume, knowing that thorium and other alpha-emitting radioisotopes are present in natural materials such as concrete, that any alpha activity detected, after background was subtracted, would be assumed to come from licensed material.

All ten survey units met the acceptance criteria for removable contamination (determined by wipe tests). Nine of the ten SUs met the acceptance criteria for total contamination (determined by direct measurement). Eighteen of the 22 direct measurements in SU-10 exceeded the release criteria. It was discovered that the SU-10 floor was poured in the late 1980s or early 1990s, whereas the main portion of the Building 10 slab was poured in 1968. SU-10 was never used for any manufacturing of any kind, including TD-Ni manufacturing, so it is unlikely that the source of the elevated readings was licensed material. It is almost certainly due to the presence of naturally radioactive material in the concrete used in the 1980s pour (e.g., sand or aggregate from a different source) that was not present in the original slab. There is analytical evidence to support this.

Based on the data collected and on the statistical analysis of that data, and based on visual inspection of the concrete floor and concrete surface samples, this survey and investigation shows that concentrations of licensed radioactive material remaining at the P&W Middletown site meet the requirements of the Nuclear Regulatory Commission and the state of Connecticut for unrestricted release. These levels are also ALARA. Residual licensed radioactivity that might be present would not deliver an annual dose of more than 19 millirem (mrem) to the person in the future who is likely to receive the largest dose from these materials. Therefore this facility now meets both NRC and State DEEP requirements for unrestricted radiological release.

1. Introduction

United Technologies Pratt & Whitney (P&W) is licensed by the U.S. Nuclear Regulatory Commission (NRC) to possess and use radioactive material within Building 10 at the 400 Aircraft Road, Middletown, Connecticut facility. This building was constructed in 1968 and had been used for the manufacture of jet engine heat shields containing a Nickel-Thorium alloy (2% thorium, commonly referred to as TD-Nickel or TD-Ni), the thorium component of which is licensed material. The only isotope listed on the P&W license is Thorium-232 (Th-232, $t_{1/2}$ = 1.4E+10 years).

This final radiological status survey was designed and carried out in accordance with the MARSSIM[1] method, which is accepted by NRC, EPA and OSHA.

Refer to the document "Decommissioning Plan for Building 10" dated July 16, 2012 (previously submitted to NRC) for background and history of this building.

2. Purpose and Scope

The purpose of this document is to:

a. Report the results of a scoping survey and final radiological status survey for what remains of Building 10 and;
b. Remove Building 10, and the Middletown site, from the Pratt &Whitney license.

The scope of this document is to determine the final radiological status of what remains of Building 10.

The decommissioning activities described in this document consist of determining whether or not any residual contamination exists on the remaining concrete pad at Building 10 that exceeds the federal or state free-release criteria. P&W expected that there would be no residual contamination on the remaining pad in excess of the NRC's derived concentration guideline levels ($DCGL_W$s), so the scoping survey was designed to also meet the MARSSIM requirements for a final status survey (FSS).

3. Facility Description

The P&W Middletown, Connecticut site is located on 1,100 acres of land in Middlesex County on the west bank of the Connecticut River. Building 10 is located near the southwestern edge of the property and covers a little more than 4.5 acres. Since all of the wood factory floor blocks and approximately 30% of the underlying concrete were removed during PCB remediation between 2004 and 2007, the net area of remaining concrete available to be surveyed is about 3.2 acres.

[1] NUREG-1575, Rev. 1. Multi-Agency Radiation Site Survey and Investigation Manual.

4. Survey Preparations

a. Historical Site Assessment

Building 10 at the P&W site in Middletown, Connecticut was used prior to 2000 for the manufacture of heat shields (under NRC License SMB 151) that are used in one of P&W's jet engines. The material used is an alloy of 2% thorium in 98% nickel (*not* a thorium coating). The stock material was not alloyed by P&W but was provided in sheets by a vendor. It is commonly referred to as "TD-Nickel."

Licensed activities in Building 10 ceased in 2000 when the stock material and manufacturing equipment were moved to the East Hartford Facility. Other (non-licensed) manufacturing continued in Building 10. A decommissioning survey performed at that time (RSA-2000) was designed to meet older criteria and may not have met the regulatory requirements in effect at that time for release of buildings and grounds, and was never submitted to NRC for review.

Building 10 was demolished between August 2004 and December 2004. All remaining equipment, the roof and supporting columns and the wood block floor were removed leaving only the concrete slab on the site. Since PCB contamination had been found on the wood floor it was sent to a TSCA/Hazardous Waste permitted secure chemical landfill [2] beginning on September 16, 2004. In 2006-2007 PCB-impacted concrete and underlying soil remediation was undertaken at the Building 10 site. This resulted in the removal of approximately 30% of the slab area. Where concrete was removed, underlying gravel and soil was also removed. All excavations were backfilled and bituminous concrete caps were installed over a few of these areas. Currently, the only component that remains of Building 10 is about 70% of the PCB-remediated concrete pad. See Figure 1.

b. Radionuclide of Concern

The only radionuclide that was ever on the Middletown license was Th-232. Th-232 decays by alpha particle emission. It also produces a gamma ray with 63.8 keV with a yield of only 0.267%.

c. Residual Radioactivity Limits ($DCGL_w$s)

The only radioisotope listed on P&W's radioactive material license is Th-232. Therefore the results of all measurements were compared to the Th-232 $DCGL_w$. While this alpha-emitting contaminant is presumed to be present in background, P&W has decided to assume that any alpha activity significantly in excess of local background detected on surfaces at this facility will be assumed to be the result of licensed activity. This is a conservative assumption. The acceptable decision error rates were determined during the DQO process. The Type I error (α) was specified as 0.05 and Type II decision error (β) was set at 0.05. The shift, Δ, also referred to as the lower bound of the gray region (LBGR), was set at 50% of the derived concentration guideline level ($DCGL_w$). The standard deviations of the data points were calculated in accordance with the method provided in the Protean Instruments Corporation user's manual.

[2] Chemical Waste Management Chemical Services, LLC, 1550 Balmer Road, Model City, NY 14107.

The null hypothesis for each survey unit is that the residual radioactivity concentrations exceed the release criterion. Acceptable decision error probabilities for testing the hypothesis were determined to be 0.05 for Type I error (α) 0.05 for Type II error (β) for the Class 2 concrete survey units.

The minimum number of sample points for each survey unit as calculated using the MARSSIM calculator.

Th-232	NRC (State) $DCGL_w$ ($dpm/100cm^2$)	Δ (LBGR) ($dpm/100cm^2$)	σ ($dpm/100cm^2$)	Δ/σ	Number of Samples required per survey unit by MARSSIM
Removable	0.6 (0.5)	0.3	0.18	1.66	15
Direct	6.0 (5.0)	3	1.74	1.72	15

Table 1. Th-232 $DCGL_w$ and related data (from Federal Register Vol. 63, No. 222, Wed. Nov. 18, 1998, p. 64134).

d. Area Classification Based on Contamination Potential

P&W considers the probability of residual Th-232 contamination existing on the remaining concrete slab to be very small. For the reasons described in the previously submitted decommissioning plan, the remaining concrete pad (approximately 11,000 m^2) will be considered a MARSSIM Class 2 area. These are areas that have, or had, a potential for radioactive contamination or known contamination, but are not expected to exceed the $DCGL_W$. P&W expects that there will be no residual contamination on the remaining pad in excess of the NRC screening values and will therefore design the scoping survey to also meet the MARSSIM requirements for a final status survey (FSS).

Figure 1. The Building 10 pad as it now exists. Concrete has been removed from the dark areas. The darkest area (upper right) is a large bituminous concrete cap, part of the PCB remediation project.

e. Survey Unit Designation

The Building 10 pad was divided into ten (10) survey units (SU). See Figures 2 and 4. SU-4 was selected as the background (reference) area for purposes of the direct measurements. It contained the cafeteria and was judged to be the least likely of the survey units to have been contaminated. Figure 2 shows the boundaries of those survey units. Figure 3 shows the former TD-Ni production areas.

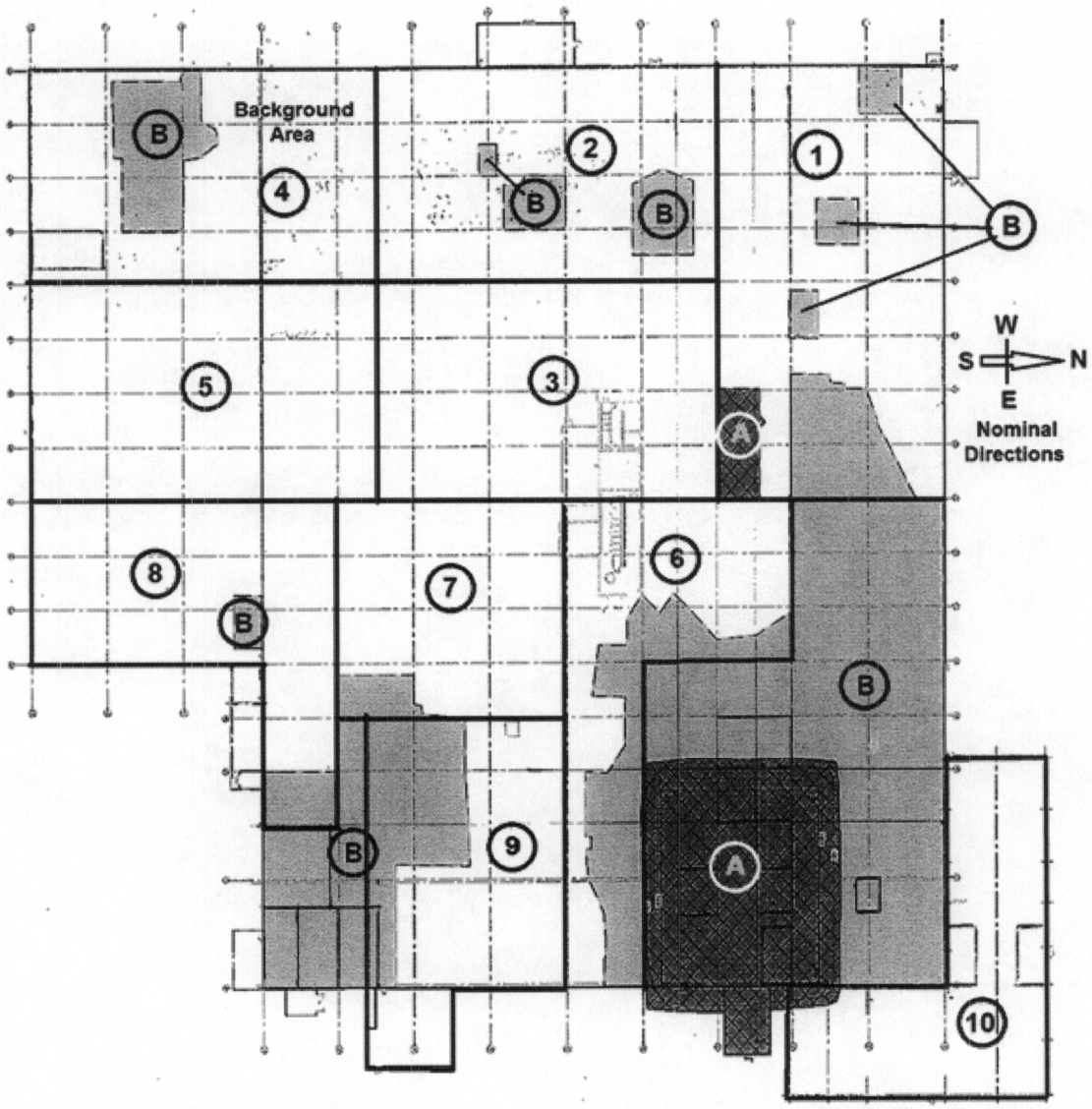

Figure 2. Drawing of the Building 10 pad showing the 10 survey units. Areas labeled "A" indicate areas with bituminous concrete caps. Areas labeled "B" have been excavated and backfilled with crushed stone. No original concrete floor remains in any of these areas.

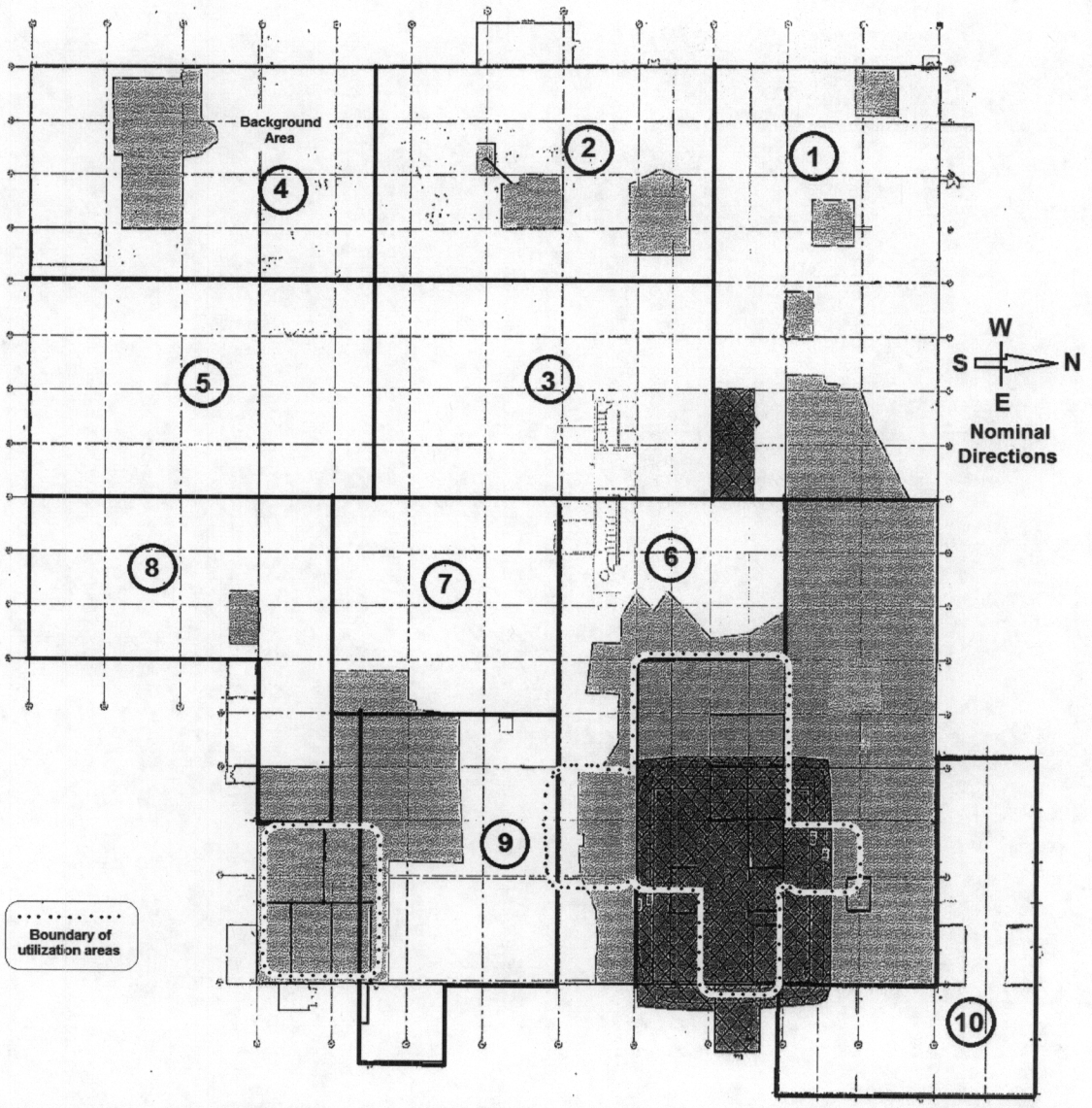

Figure 3. Drawing of the Building 10 pad showing the 10 survey units. The two areas within the dotted lines are those where the TD-Ni manufacturing took place. The concrete from virtually all of these areas was removed and disposed during PCB remediation in 2006-2007.

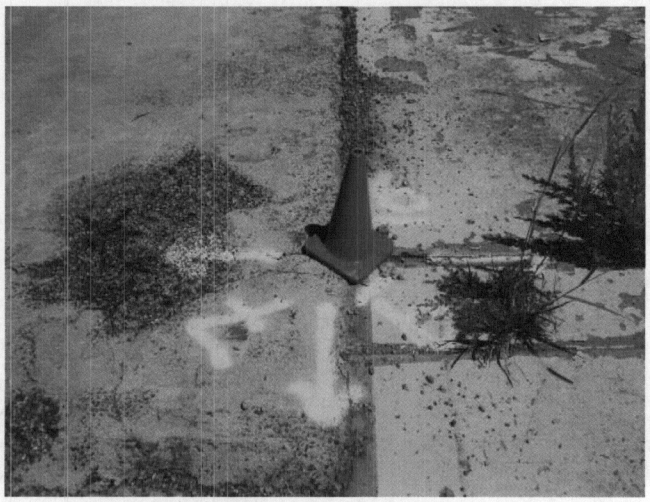

Figure 4. The intersection of SUs 6, 7 and 9.

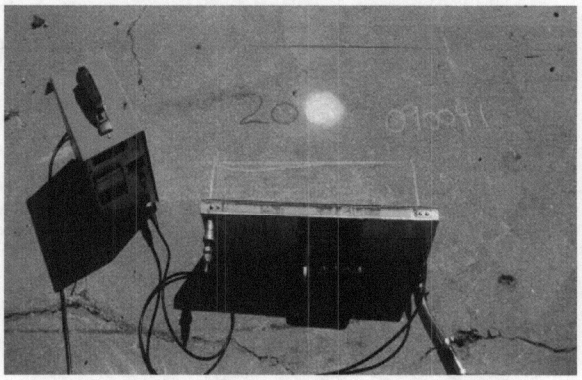

Figure 5. Photo showing method of locating each survey point (white dot) and indicating each direct measurement location (yellow rectangle).

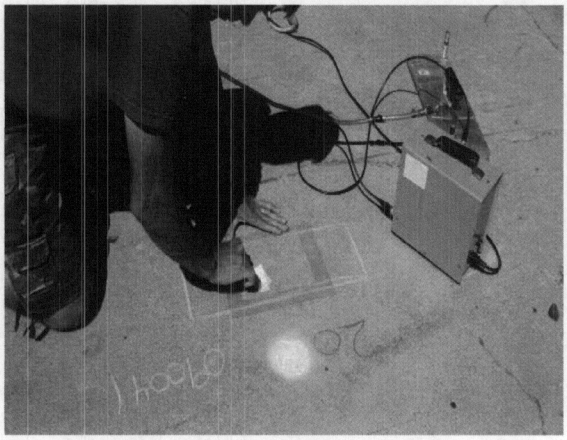

Figure 6. Photo: Use of a frame ensures that each wipe sample covers 300 cm^2 (17.3 cm x 17.3 cm).

f. Survey Instrumentation and Survey Techniques

Scan Survey

Scanning was performed using two Ludlum Model 43-37 gas proportional detectors with Ludlum Model 2224 scaler-rate meters. These were configured as Ludlum 239-1F floor monitors (Figure 7). Each 43-37 has an active detection area[3] of 584 cm^2. The scan surveys were performed with the detector at a distance of approximately 1 cm from the surface of the concrete and the scanning speed was kept to less than one detector width (6 inches) per second.

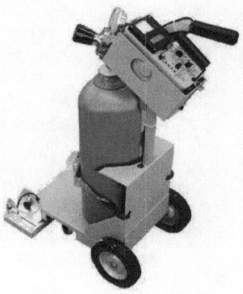

Figure 7. Ludlum Model 239-1F floor monitor (Model 43-37 + Model 2224).

The scan survey was not designed to demonstrate compliance with any guideline value. It was intended as an ALARA measure to monitor essentially the entire surface of the concrete pad. This would establish whether or not there were any large concentrations of radioactive material present that might be missed by the randomly selected and distributed MARSSIM samples and measurements.

Detector/Ser #	Meter/Ser #	Detector Type	Alpha Eff. (%)	Measurement Type
L-43-37/113573	L-2224/119815	Proportional	16.2	Scan
L-43-37/103776	L-2224/129459	Proportional	11.8	Scan
L-43-1-1/155183	L-1000/61567	Phoswich	26.5	Direct
L-43-1-1/166008	L-2200/112636	Phoswich	27.15	Direct
L-43-37/160827	MS-2/794	Proportional	17.9	Direct
L-43-37/113573	MS-2/795	Proportional	17.9	Direct
L-43-37/090041	L-1000/61567	Proportional	16.9	Direct
L-43-37/110613	L-2200/112636	Proportional	18.2	Direct
L-43-37/110613	L-2200/112636	Proportional	16.5	Direct
L-44-6/092310	L-Model 3/94492	G-M	--	Gamma Walkover

Table 2. List of instruments used on the project.

[3] Ludlum Measurements catalog information.

Direct Measurement

Direct (static) measurements were made with the detector in direct contact with the surface of the concrete. The detectors used for these measurements were four (4) Ludlum[4] Model 43-37 large-area (584 cm^2) gas proportional detectors, each in association with a Ludlum or Eberline[5] counter-scaler. Each 43-37/counter-scaler pair was calibrated and had efficiency measured as a unit. A Sr-90/Y-90 source was used to confirm that there was no beta cross-talk in any of the detectors. The MARSSIM equation for lower limit of detection (LLD) is given below. The calibration certificates for these detectors are contained in Attachment A.

$$LLD_{95\%} = \frac{3 + 2k_1\sqrt{R_b t_s\left(1+\frac{t_s}{t_b}\right)}}{(t_s)(E)\left(\frac{A}{100}\right)(C)}$$

Based on the background counting rate and detector efficiency, background and sample counting times were established for each detector-scaler combination. Table 3 below shows all of these values. An example calculation is shown below based on detector-scaler combination 3 from Table 3 below.

$$\alpha\ LLD_{95\%} = \frac{3 + 3.29\sqrt{65 * 70\left(1+\frac{70}{360}\right)}}{(70)(0.179)\left(\frac{584}{100}\right)(1)} = \frac{245.5}{73.2} = 3.4\,\text{dpm}/100\,\text{cm}^2$$

k_1 = 1.645 (the 1-sided confidence factor at 95%)
A = 584 cm^2 (active detector area)
C = 1 (unit conversion factor from dpm, i.e., no unit conversion factor used)

	Detector/Ser #	Meter/Ser #	Alpha Eff. (%)	Bkgd Count Rate (R_b)	Sample count time (t_s)	Bkgd count time (t_b)	LLD (dpm/100 cm^2)
1	L-43-1-1/155183	L-1000/61567	26.5	8	180	240	4.2
2	L-43-1-1/166008	L-2200/112636	27.15	11.5	180	240	5.0
3	L-43-37/160827	MS-2/794	17.9	65	70	360	3.4
4	L-43-37/113573	MS-2/795	17.9	65	70	360	3.6
5	L-43-37/090041	L-1000/61567	16.9	70	70	360	3.9
6	L-43-37/110613	L-2200/112636	18.2	34	60	120	3.1
7	L-43-37/110613	L-2200/112636	16.5	70	70	360	4.0

Table 3. Statistical parameters for the detector-scaler combinations used on the project.

A source check was performed on each detector-scaler pair at the beginning of each work day.

[4] Ludlum Measurements, Inc., 501 Oak Street, Sweetwater, Texas 79556.
[5] Thermo Electron Corporation (formerly Eberline Instrument Corporation), 1-800 274 4212

Direct Measurement Summary

The federal $DCGL_w$ is 6 dpm/100 cm^2. The state $DCGL_w$ is 19/25 times the federal limit, or 5 dpm/100 cm^2 (rounded to one significant figure, in accordance with mathematical rules for significant figures and rounding and to be consistent with the NRC's $DCGL_w$). Therefore the minimum sensitivity of the direct measurement instruments and procedures (LLDs) meet both the federal and state requirements.

Wipe Tests

Wipe tests were taken using industry standard adhesive-backed 1.75-inch diameter cotton twill circle applied to a 2⅝ inch by 3¾ inch record paper. Each wipe sample was taken over an area of 300 cm^2 in order to get the lower limit of detection (LLD) down to the guideline value without using extraordinarily long counting times. The 300 cm^2 wipe area is used in the regulations of the U.S. Department of Transportation at 49 CFR 173.443 for performing measurements of non-fixed contamination on packages of radioactive material, so we believe that our use of a sample size of 300 cm^2 is justified. See Figure 6.

Wipe Test Evaluations

The wipes were analyzed using RSA Laboratories' low background gas proportional counter (Protean[6] Model No. 1409, Serial No. 4090499). The LLD equation is shown below.

$$LLD_{95\%} = \frac{3 + 2k_1\sqrt{R_b t_s\left(1 + \frac{t_s}{t_b}\right)}}{(t_s)(E)\left(\frac{A}{100}\right)(C)}$$

Where:
k_1 = 1.645 (the 1-sided confidence factor at 95%)
R_b = 0.07 cpm (background count rate)
t_s = 19 minute (sample count time)
t_b = 600 minute (background count time)
E = 27.29% counter efficiency)
A = 300 cm^2 (area wiped)
C = 1 (unit conversion factor from dpm, i.e., no unit conversion factor used)

Inserting the actual values for alpha into the equation above we get:

$$\alpha\ LLD_{95\%} = \frac{3 + 3.29\sqrt{0.07 \times 19\left(1 + \frac{19}{600}\right)}}{(19)(0.2729)\left(\frac{300}{100}\right)(1)} = \frac{7.4}{19.8} = 0.4\,\text{dpm}/100\,\text{cm}^2$$

The lower limit of detection (LLD) for wipe sample evaluation for this project is 0.4 dpm/100 cm^2.

[6] Protean Instrument Corporation (PIC), 231 Sam Rayburn Parkway, Lenoir City, TN 37771.

Detector and Ser #	Alpha Eff. (%)	Bkgd Count Rate (R_b)	Sample count time (t_s)	Bkgd count time (t_b)	LLD (dpm/100 cm^2)
Protean Inst. Corp	27.29	0.07	19	600	0.4

Table 4. Statistical parameters for the Protean wipe counter used on the project.

Wipe Test Summary

The federal $DCGL_W$ is 0.6 dpm/100 cm^2. The state $DCGL_W$ is 19/25 times the federal limit, or 0.5 dpm/100 cm^2 (to one significant figure, in accordance with mathematical rules for significant figures and rounding and to be consistent with the NRC's $DCGL_W$). Therefore the minimum sensitivity of the wipe sampling and evaluation process meets both the federal and state requirements.

g. Reference (Background) Area

SU-4 was selected as the background area for the purposes of evaluating gross alpha activity on the concrete pad by direct measurement. It contained the cafeteria and was judged to be the least likely of the survey units to have been contaminated (see Fig. 2).

Background used for counting wipe samples was machine background only, with no allowance made for any removable activity from naturally occurring radioactive material.

h. Area Preparation

Since Building 10 had already been demolished down to the concrete pad, no preparation was required. During the course of the direct scan survey, some stray pieces of gravel had to be moved out of the way to avoid puncturing the windows of the proportional counter detectors that were used for this survey.

i. Reference Coordinate Systems

The number of sample points in each survey unit was determined using the MARSSIM calculator. Due to the irregular shape of some of the survey units (caused by the portions of the concrete pad removed during PCB remediation) more than the minimum number of survey points was used to compensate for the random points that were likely to fall in the various PCB-remediated areas where measurements couldn't be made. Each survey unit was independently established using a rectangular survey grid based on a random start point. See Attachment B.

5. Survey Design

a. Sample Collection and Analysis Procedures

Attachment B shows the random start point and sample locations for all nine survey units (SU-1 through 3 and 5 through 10) and the reference (background) unit (SU-4). Each sample point within each survey unit was marked with a dot of spray paint. Direct measurements were made immediately adjacent to each dot. See Figure 5. The outline of the detector was drawn on the concrete for future reference. Direct measurement results were logged on a data sheet.

Wipe samples were also collected adjacent to each dot. See Figure 6. They were labeled with the number of the survey unit and with the survey point within the survey unit. Wipes were sealed and transported to RSA Laboratories[7] for analysis in a gas proportional counter.

6. Acceptance Criteria

These surveys were accomplished in accordance with the requirements stated in 10 CFR 20.1402.

> **§ 20.1402 Radiological criteria for unrestricted use.**
> A site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results in a TEDE to an average member of the critical group that does not exceed 25 mrem (0.25 mSv) per year, including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as reasonably achievable (ALARA). Determination of the levels which are ALARA must take into account consideration of any detriments, such as deaths from transportation accidents, expected to potentially result from decontamination and waste disposal.

Guidance for this decommissioning was taken from NUREG-1757, Vol. 1, Rev. 1 (Consolidated NMSS Decommissioning Guidance – Decommissioning Process for Materials Licensees) and from NUREG-1575, Rev. 1 (the Multi Agency Radiological Site Survey and Investigation Manual—MARSSIM).

Acceptance criteria were established based on the NRC recommendations (*Federal Register* Vol. 63, No. 222, Wed. Nov. 18, 1998, p. 64134 and Vol. 64, No. 234, Tues. Dec. 7, 1999, p. 68395) for release of facilities for unrestricted use following decommissioning, for the isotope potentially present in the buildings surveyed.

Since the acceptable release criteria for total and removable Th-232 are so small, compliance with those criteria is assumed to also be ALARA. The release criteria used for this project are summarized in Tables 5 and 6 below. The federal limits are the concentrations of each radionuclide that, if present in a building released for unrestricted use could deliver a dose of 25 mrem per year to the person likely to receive the highest dose from all pathways. The State of Connecticut has determined that this release criterion should be 19 mrem per year instead of the 25 mrem per year upon which the $DCGL_W$ values are based. Therefore, since only a single

[7] NRC license 06-30007-01.

radioisotope is listed on the license, the limits have simply been reduced by a factor of $\frac{19}{25} = 0.76$ to show compliance with State rules. Since only one isotope is involved, a more rigorous derivation of a $DCGL_W$ to show compliance with the State limit was judged to be unnecessary.

The direct survey (total contamination) $DCGL_W$ for Th-232 is given in the table below in units of dpm/100 cm^2 along with the State limit.

	NRC Value[8]	State Limit[9]
Th-232	6	5

Table 5. Derived Concentration Guideline Levels ($DCGL_W$s) for total contamination (dpm/100 cm^2).

As specified in NRC instructions, the $DCGL_W$ for removable contamination (wipe survey limits) are 10% of the values shown in Table 5 above and are given in Table 6 below.

	NRC Value[10]	State Limit[11]
Th-232	0.6	0.5

Table 6. Derived Concentration Guideline Levels ($DCGL_W$s) for removable contamination (dpm/100cm^2).

In the calculation of all survey results, background was subtracted from the sample count rate before results were calculated and compared to the release criteria.

Summary

The LLDs for the instruments used are summarized in Table 7 below. Details are contained in section 4.f. above.

Survey Type	Instrument	LLD (dpm/100cm^2)	NRC $DCGL_W$		CT Limit[12]	
			Total	Removable	Total	Removable
Wipe Analysis	Protean	0.4	6	0.6	5	0.5
Direct measurement	L-43-1-1+ L-1000	4.2	6	0.6	5	0.5
Direct measurement	L-43-1-1+ L-2200	5.0	6	0.6	5	0.5
Direct measurement	43-37+L-1000	3.9	6	0.6	5	0.5
Direct measurement	43-37+L-2200	3.1/4.0[13]	6	0.6	5	0.5
Direct measurement	43-37+MS-2	3.4	6	0.6	5	0.5
Direct measurement	43-37+MS-2	3.6	6	0.6	5	0.5
Walkover gamma	L-3 + L- 44-6	~0.01 mR/h	ALARA	ALARA	ALARA	ALARA

Table 7. Minimum detectable activities at 95% confidence for the detection equipment used on this project.

[8] From 63FR64134 table I.
[9] To one significant figure in accordance with mathematical rules for significant figures and rounding, and to be consistent with the NRC's DCGL.
[10] From 63FR64134 table I footnote 1.
[11] Rounded to one significant figure in accordance with mathematical rules for significant figures and rounding, and to be consistent with the NRC's DCGL.
[12] *Ibid.*
[13] After window change.

7. Final Radiological Status

a. Wipe Results

Survey Units 1 through 10

The Final Status Survey (FSS) results of the wipe samples from Survey Units 1 through 5 and SU-7 contain no removable activity that exceeds the target $DCGL_W$s for removable contamination (0.5 dpm/100 cm^2). These results are contained in Attachments C.

SU-6 contained one wipe result that exceeded the state but not the federal limit. SU-9 had one wipe result that exceeded both the state and the federal limit. SU-10 had two wipe results that exceeded both the state and the federal limit. Following the instructions in MARSSIM[14] (Section 8.4) for potential contaminating isotopes that are also present in background, the Wilcoxon Rank Sum (WRS) test was applied. For all three of these survey units the sum of the reference area ranks is greater than the critical value, so the null hypothesis (*i.e.*, that the average survey unit concentration exceeds the $DCGL_W$) is rejected and the units pass the test. See Attachment G for the WRS data.

b. Direct Radiation Measurement Results

All survey units (SU-1 through SU-3 and SU-5 through SU-10) had one or more measurement points that did not meet the $DCGL_W$. SU-4 had been selected as the background area for purposes of the direct measurements.

Following the instructions in MARSSIM[15] (Section 8.4) for potential contaminating isotopes that are also present in background, the Wilcoxon Rank Sum (WRS) test was applied. For SU-1 through SU-3 and SU-5 through SU-9, the sum of the reference area ranks is greater than the critical value, so the null hypothesis (*i.e.*, that the average survey unit concentration exceeds the $DCGL_W$) is rejected and the units pass the test. See Attachment H for the WRS data.

Survey Unit 10

Eighteen of the 22 direct measurements in SU-10 exceeded the $DCGL_W$. The WRS test showed that the null hypothesis applied in this survey unit: SU-10 did not Pass the WRS test.

It must be noted that SU-10 was never used for any manufacturing of any kind, including TD-Ni manufacturing. It was added on to Building 10 as additional warehouse and storage space. For this area to become widely contaminated is judged to be very unlikely.

[14] NUREG-1575, Rev. 1.
[15] *Ibid.*

c. Possible Explanations for Elevated Direct Readings in SU-10

1) Thorium and uranium are endemic in natural minerals, and the concentrations are unpredictable. Therefore isotopic analyses were performed to identify the specific constituents present. The only isotope on P&W's license is Th-232. To simplify the FSS, it had been decided to make gross alpha measurements rather than to attempt an isotope-specific evaluation. P&W realized that accepting gross alpha readings could result in readings that exceeded the $DCGL_w$ especially since the $DCGL_w$s are so small (5 dpm/100 cm^2). Factors that could affect elevated readings are:
    a. Increase in background counting rate during long measurement times,
    b. Differences in radioactive constituents of the concrete mix.

2) P&W personnel report that the L-shaped SU-10 (Figure 2) was added to the building between 1988 and 1993, well after the main part of the building was constructed in 1968. Individuals who had worked in Building 10 and who were still available were queried about this area. It was confirmed that this addition was intended to be, and was always used as, warehouse storage space.

3) Visual examination of the concrete slab in this area confirms that it is lighter in color than the rest of the floor. The origin and composition of the components used in the concrete for this addition are unknown and not able to be discovered.

4) No smelting or alloying of the TD-Ni metal was done in Building 10 or at any P&W site. Also, no other kind of high temperature work[16] was done on this metal, so no radioactive fumes[17] or other finely divided particulate contamination was ever produced. Any contamination present would have been the result of stamping, forming, de-burring, tumbling, polishing or some other low velocity, relatively low temperature operation. Any particulate contamination produced during the manufacturing process would have been both insoluble in water (solid metal) and greater than 10 µm MMAD[18]. For the above reasons, any residual particulate contamination would be in the form of metallic grains, granules, specs or small chips. A close examination of the surface of SU-10, in some places using a magnifying glass, did not discern the presence of any such grains, granules, specs or small chips. The entire surface of the concrete appeared to be mineral in nature.

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[16] Meaning temperatures exceeding the melting point or vaporization point of thorium (1750°C and ~4790°C respectively). For comparison, nickel melts at 1455 °C and vaporizes at 2913 °C.
[17] An aerosol consisting of small solid particles produced by the condensation of vapors or gaseous combustion products. Usually, such particles are aggregates made up from large numbers of very small primary particles, with the individual units having dimensions on the order of a few nanometers (nm) and upwards although less than 1µm.
[18] Mass median aerodynamic diameter.

Uranium Series Alpha Emitters	
Isotope	**Half-life**
U-238	$4.468 \cdot 10^9$ yr
U-234	245500 yr
Th-230	75380 yr
Ra-226	1602 yr
Rn-222	3.8235 d
Po-218	3.10 min
At-218	1.5 s
Rn-218	35 ms
Po-214	0.1643 ms
Po-210	138.376 d

Thorium Series Alpha Emitters	
Isotope	**Half-life**
Th-232	1.405×10^{10} yr
Th-228	1.9116 yr
Ra-224	3.6319 d
Rn-220	55.6 s
Po-216	0.145 s
Bi-212	60.55 min
Po-212	299 ns

Table 8. The alpha-emitting isotopes in the primordial uranium and thorium series.

5) The assumption is made that any thorium or uranium contained in the concrete pad in SU-10 was in equilibrium with its daughters[19,20,21]. The expected concentration of each isotope in the thorium series (Attachment H) would be 1.1 pCi/g (41 Bq/kg)[22]. It is also reported that the ratio of thorium to uranium in orthoquartzitic, clay-free sand is about 3.8[23] and the Th/U ratio in beach sand is about 2.1[24]. The radioactive material is contained almost entirely in the quartz, where it appears to be largely related to microscopic and submicroscopic inclusions. An increase in the quartz component of the sand mix, due to a change in the source of sand by the concrete supplier, could easily account for the elevated natural radioactivity in the cement in SU-10.

6) There are seven alpha-emitters in the thorium series and nine (significant) alpha emitters in the uranium series. The conclusion is that for every increase of 1 pCi/g of Uranium or Thorium in concrete, the gross alpha activity would increase significantly.

[19] Starting with a quantity of pure Th-232 it would take approximately 41 years for Ra-228 to equilibrate with Th-232. Since Ac-228 and Th-228 have significantly shorter half-lives than Ra-228, and Ra-224 through Po-212/Tl-208 have very short half-lives, it would take roughly one additional month for the whole series to achieve >99% equilibrium.

[20] Murray, Elaine G. and John A.S. Adams. "Thorium, uranium and potassium in some sandstones." *Geochimica et Cosmochimica Acta*, vol. 13, Issue 4, pp.260-269. 1958.

[21] NCRP-93.

[22] George Chabot, PhD, CHP at http://hps.org/publicinformation/ate/q9057.html.

[23] Murray, Elaine G. and John A.S. Adams. "Thorium, uranium and potassium in some sandstones." *Geochimica et Cosmochimica Acta*, vol. 13, Issue 4, pp.260-269. 1958.

[24] NCRP-94.

d. Alpha Spectra

Three surface samples were obtained for alpha spectrum analysis. These were carefully scraped from the surface of the cement in the following locations:

Sample Location	Direct Measurement (dpm/100 cm^2)
SU-10-8	94.22
SU-10-1	39.77
SU-10-9 For reference	-8.40

Table 9. Alpha spectrum sample locations (see Attachment B) and results of direct alpha measurements at each location.

Each sample was taken from approximately 5 cm^2 of surface, to a depth of no more than 0.32 cm (⅛ inch). A fourth sample was obtained at sample location SU-10-9 from a depth of between ⅛ inch and ¼ inch in order to try to get an idea of alpha-emitting isotopes below the surface that would not contribute to direct alpha measurements.

A close, optically magnified examination of each of these samples showed that there were no grains, granules, specs or small chips of metal present. All sample material appeared to be mineral in composition.

Each sample was pulverized with a mortar and pestle and put through an 80 mesh sieve. Each sample analyzed had a mass of approximately 1 gram. Each was tested for both thorium and uranium. A summary of the results is shown in Table 10 below. The alpha spectrum details are in Attachment E.

	Th-232+D	Result (pCi/g)	$LLD_{95\%}$
SU-10-8 Surface	Th-232	0.133	0.028
	Th-228	0.040§	0.052
SU-10-1 Surface	Th-232	0.132§	0.264
	Th-228	-0.154§	0.762
SU-10-9 Surface	Th-232	0.256§	0.370
	Th-228	0.158§	0.631
Su-10-9 Sub-surface	Th-232	0.106§	0.280
	Th-228	-0.279§	0.607

	U-238+D	Result (pCi/g)	$LLD_{95\%}$
SU-10-8 Surface	U-238	0.517	0.355
	U-234	0.722	0.355
	Th-230	0.661	0.281
	U-235	-0.164§	0.355
	U:Th = 11.3		
SU-10-1 Surface	U-238	0.329§	0.368
	U-234	0.388	0.368
	Th-230	0.633	0.264
	U-235	-0.113§	0.368
SU-10-9 Surface	U-238	0.142§	0.438
	U-234	0.155§	0.438
	Th-230	0.700	0.226
	U-235	-0.135§	0.438
Su-10-9 Sub-surface	U-238	0.174§	0.357
	U-234	0.195§	0.357
	Th-230	0.617	0.280
	U-235	-0.116§	0.357

§ = Less than the LLD

Table 10. Summary of alpha spectrum analyses of four surface samples from four areas of SU-10.

It is clear that in the surface samples that U238, U-234 and Th-230 are contributing substantially more alpha activity than Th-232 + Th-228. For the one alpha spectrum sample where the measured values exceeded the LLD, the U+D-to-Th+D ratio is roughly 11. If the direct measurement results in SU-10 were each divided by 11, only one measurement would still exceed the DCGL and the Unit would pass when the WRS Test is applied. See Table 11 below.

Location	Direct Measurement	Direct ÷ 11
SU-10-1†	39.77§	3.62
SU-10-2	27.11§	2.46
SU-10-3	32.86§	2.99
SU-10-4	24.81§	2.26
SU-10-5	20.78§	1.89
SU-10-6	23.71§	2.16
SU-10-7	17.52§	1.59
SU-10-8†	94.22§	8.57§
SU-10-9†‡	-8.4	---
SU-10-10	9.11§	0.83
SU-10-11	8.93§	0.81
SU-10-12	17.52§	1.59
SU-10-13	-17.66	---
SU-10-14	12.25§	1.11
SU-10-15	15.69§	1.43
SU-10-16	18.81§	1.71
SU-10-17	12.77§	1.16
SU-10-18	0.07	0.01
SU-10-19	22.45§	2.04
SU-10-20	15.34§	1.39
SU-10-21	-5.73	---
SU-10-22	9.75§	0.89

§ = greater than DCGL
† = Alpha spectrum surface sample location
‡ = Alpha spectrum sub-surface sample location

Table 11. Survey Unit 11 direct survey data and the same divided by a factor of 11. One value exceeds the DCGL but the unit would pass when the WCS Test is applied.

e. Summary and Conclusions

Several possibilities exist that could explain the elevated gross alpha activity found in SU-10.

1. If the sand or some other component of the concrete mix used in SU-10 contained more natural radioactive material (simply dependant on where the material was obtained) than that which was used in the concrete for the original pad, the alpha emission rate from the surface would be elevated.
2. If fly ash had been used in place of some of the sand in this concrete mix[25], a significant amount of additional natural radioactive material would have been added to this concrete.
3. Close visual inspection of the surface and the surface samples of the concrete in SU-10 showed no visual evidence of the TD-Ni metal granules, flakes or chips that would be expected if the contamination had come from P&W's activities.
4. Given the serendipitous nature of natural radioactivity in concrete components, it is clear by direct observation that the concrete used in the SU-10 area was substantially different from the concrete used for the main portion of the pad. The alpha spectra described above indicate that the elevated alpha activity in this survey unit is most likely attributable to Uranium and its daughters, and not to Thorium. It is therefore not attributable to the presence of licensed material. There are a total of 10 alpha emitters in the Uranium Series (9 significant) and 7 total in the Thorium Series. Refer to Appendix H.

It is our conclusion that the additives to the concrete used for the added-on SU-10 floor, contained a higher concentration of naturally occurring radioactive material, specifically Uranium and daughters, than the floor in the original portion of the building. This is what resulted in the higher gross alpha readings. No other concrete area could be located that originated from that SU-10 batch of concrete. Therefore there is no background area that is representative of the concrete in SU-10 that could be used as a background area and subtracted from the readings taken in that survey unit.

Analytical evidence indicates that Uranium and its daughters are eleven times more abundant in the SU-10 concrete than Thorium and its daughters. Visual inspection of the concrete floor and concrete surface samples clearly confirms that licensed material (TD-Ni metal) in the form of metallic grains, granules, specs or small chips is not present in SU-10. There is ***no*** evidence to indicate that licensed material is the source of the elevated radioactivity in SU-10.

[25] Sarah C. Taylor Lange, Maria Juenger, and Jeffrey A. Siegel. "Indoor Radon Exhalation Rates from Concrete with Fly Ash." The University of Texas at Austin, Austin, TX, USA. www.ce.utexas.edu/prof/siegel/papers/conference/taylor_2011_flyash_rn_ia2011_1015.pdf

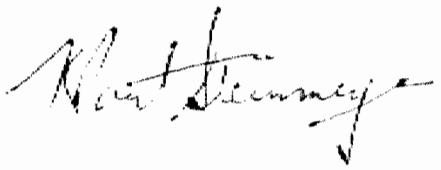
8. Final Radiological Status

Based on the data collected and on the statistical analysis of that data, and based on visual inspection of the concrete floor and concrete surface samples, this survey and investigation shows that concentrations of licensed radioactive material remaining at the P&W Middletown site meet the requirements of the Nuclear Regulatory Commission and the state of Connecticut for unrestricted release. These levels are also ALARA. Residual licensed radioactivity that might be present would not deliver an annual dose of more than 19 millirem (mrem) to the person in the future who is likely to receive the largest dose from these materials. Therefore this facility now meets both NRC and State DEEP requirements for unrestricted radiological release.

February 19, 2013

Jay R. Dockendorff, DPM
Laboratory Director

Date



February 19, 2013

K. Paul Steinmeyer, RRPT
Senior Health Physicist

Date

Attachment A

Calibration Certificates for Detectors

Attachment A

CERTIFICATE OF CALIBRATION
(COUNTER/SCALER)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Radiation Safety Associates, Inc. Attn: K. Paul Steinmeyer (860) 228-0487**
Customer Address: **P.O. Box 107, 19 Pendleton Drive, Hebron, CT 06248**

Inst. Mfr. & Model **Ludlum Model 1000**	Inst. Type **Scaler**	Inst. s/n **61567**
Det. Mfr. & Model **Ludlum 43-1-1**	Type **Alpha/Beta Scintillator**	Det. s/n **155183**
Cal. Date **24 July 2012**	Due Date **24 July 2013**	Cal. Interval **1 year**

Environmental conditions: Temperature: **72°F** Relative Humidity **48%** Atmospheric Pressure **29.52** inches Hg
Pre-calibration Checks:

☒ Contamination survey	☐ Battery check	☐ Slow response check	
☒ Mechanical check	☐ Audio check	☐ Window operation	☒ Det. volts **600** Vdc
☒ Meter zero	☒ Reset check	☒ Plateau check	
☐ Geotropism check	☐ Fast response check	☐ Alarm set	☒ Input sens. **40** mV

☒ Pulse generator s/n 94926 ☐ Oscilloscope s/n 171-04928 ☒ Voltmeter s/n 57410002
☒HV Readout (2 points) Ref./Inst. **500 V/ 500 V** Ref./Inst. **1000 V/ 1000 V**

Comments: **Local background ≈ 1 cpm. Efficiency determined with detector at near contact.**

S/N of source used for precision check **0210** Isotope **Th-230** Dedicated Source? ☐Yes ☒No
Reading #1 **8723 cpm** Reading #2 **8773 cpm** Reading #3 **8750 cpm** Mean **8749 cpm**
Precision: ☒± < 10% ☐± 10-20% ☐Out of tolerance

Range Multiplier	Reference Calibration Point	Instrument Indication
6 sec. count	5000 cpm	500 cpm
12 sec. count	5000 cpm	1000 cpm
30 sec. count	5000 cpm	2500 cpm
1 min. count	5000 cpm	5001 cpm
2 min. count	5000 cpm	10,003 cpm
5 min. count	5000 cpm	25,008 cpm

All ranges calibrated electronically.

Range Multiplier	Cal. Source Used (isotope and S/N)	Source Activity (dpm)	Instrument Reading (cpm)	Instrument Efficiency (%)
1 min. count	Th-230 #91TH4700001	33,000	8749	26.5%

RSA Laboratories ID# 15001. Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determinations is 1 cm unless otherwise specified. RSA Laboratories, Inc. certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

Calibrated by: **Kurt D. Newton** Date: **24 July 2012**

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Customer Address: **P.O. Box 107, 19 Pendleton Drive, Hebron, CT 06248**

Inst. Mfr. & Model **Ludlum Model 2200**	Inst. Type **Scaler Ratemeter**	Inst. s/n **112636**
Det. Mfr. & Model **Ludlum 43-1-1**	Det. Type **Alpha/Beta Scintillator**	Det. s/n **166008**
Cal. Date **24 July 2012**	Due Date **24 July 2013**	Cal. Interval **1 year**

Environmental conditions: Temperature: **72°F** Relative Humidity **48%** Atmospheric Pressure **29.52** inches Hg

Pre-calibration Checks:

☒ Contamination survey	☒ Battery check	☒ Slow response check	
☒ Mechanical check	☐ Audio check	☒ Window operation	☒ Det. volts 650 Vdc (@240)
☒ Meter zero	☒ Reset check	☒ Plateau check	
☐ Geotropism check	☒ Fast response check	☐ Alarm set	☒ Input sens. 100 mV (@1000)

☒Pulse generator s/n 94926 ☐ Oscilloscope s/n 171-04928 ☒ Voltmeter s/n 57410002
☒HV Readout (2 points) Ref./Inst. **500 V/500 V** Ref./Inst. **1000 V/ 1000 V**

Comments: **Efficiency determined with detector at near contact with source, window OFF.**

S/N of source used for precision check **91TH4700001**Isotope **Th-230** Dedicated Source? ☐Yes ☒No
Reading #1 **8863 cpm** Reading #2 **9067 cpm** Reading #3 **8951 cpm** Mean **8960 cpm**
Precision: ☒± < 10% ☐± 10-20% ☐Out of tolerance

Range Multiplier	Reference Calibration Point	Instrument Indication
x 1K	400,000 cpm	400,000 cpm
x 1K	100,000 cpm	100,000 cpm
x 100	40,000 cpm	40,000 cpm
x 100	10,000 cpm	10,000 cpm
x 10	4,000 cpm	4,000 cpm
x 10	1,000 cpm	1,000 cpm
x 1	400 cpm	400 cpm
x 1	100 cpm	100 cpm
1 min. x 0.1	5,000 cpm (500 counts)	500 counts
1 min. x 1	5,000 cpm (5,000 counts)	5,000 counts

All ranges calibrated electronically.

Local background (cpm) ≈ 1

Range Multiplier	Cal. Source Used (isotope and S/N)	Source Activity (dpm)	Instrument Reading (cpm)	4π Instrument Efficiency (%)	2π Instrument Efficiency (%)
1 min. count	Th-230 #91TH4700001	33,000	8960	27.15	54.30

RSA Laboratories ID# **15002.** Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determinations is 1 cm unless otherwise specified. RSA Laboratories, Inc. certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

Calibrated by: **Kurt D. Newton** Date: **24 July 2012**

Attachment A

CERTIFICATE OF CALIBRATION
(COUNTER/SCALER)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
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Customer and Contact: **Radiation Safety Associates, Inc. Attn: K. Paul Steinmeyer (860) 228-0487**
Customer Address: **P.O. Box 107, 19 Pendleton Drive, Hebron, CT 06248**

Inst. Mfr. & Model **Ludlum Model 1000**	Inst. Type **Scaler**	Inst. s/n **61567**
Det. Mfr. & Model **Ludlum 43-37**	Type **Gas proportional**	Det. s/n **090041**
Cal. Date **07 August 2012**	Due Date **07 August 2013**	Cal. Interval **1 year**

Environmental conditions: Temperature: **72°F** Relative Humidity **50%** Atmospheric Pressure **29.65** inches Hg

Pre-calibration Checks:

☒ Contamination survey	☐ Battery check	☐ Slow response check	
☒ Mechanical check	☐ Audio check	☐ Window operation	☒ Det. volts **1400** Vdc
☒ Meter zero	☒ Reset check	☒ Plateau check	
☐ Geotropism check	☐ Fast response check	☐ Alarm set	☒ Input sens. **45** mV

☒ Pulse generator s/n **94926** ☐ Oscilloscope s/n **171-04928** ☒ Voltmeter s/n **57410002**
☒HV Readout (2 points) Ref./Inst. **500 V/ 500 V** Ref./Inst. **1000 V/ 1000 V**

Comments: **Local background ≈ 4 cpm. Efficiency determined with detector at near contact.**

S/N of source used for precision check **91TH4700001**Isotope **Th-230** Dedicated Source? ☐Yes ☒No
Reading #1 **5555** cpm Reading #2 **5614** cpm Reading #3 **5578** cpm Mean **5582** cpm
Precision: ☒± < 10% ☐±10-20% ☐Out of tolerance

Range Multiplier	Reference Calibration Point	Instrument Indication
6 sec. count	5000 cpm	500 counts
12 sec. count	5000 cpm	1000 counts
30 sec. count	5000 cpm	2500 counts
1 min. count	5000 cpm	5001 counts
2 min. count	5000 cpm	10,003 counts
5 min. count	5000 cpm	25,008 counts

All ranges calibrated electronically.

Range Multiplier	Cal. Source Used (isotope and S/N)	Source Activity (dpm)	Instrument Reading (cpm)	Instrument Efficiency (%)
1 min. count	Th-230 #91TH4700001	33,000	5582	16.9 %

RSA Laboratories ID# **15034**. Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determinations is 1 cm unless otherwise specified. RSA Laboratories, Inc. certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

Calibrated by: **Kurt D. Newton** Date: **07 August 2012**

Attachment A

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Customer Address: **P.O. Box 107, 19 Pendleton Drive, Hebron, CT 06248**

Inst. Mfr. & Model **Ludlum Model 2200**	Inst. Type **Scaler Ratemeter**	Inst. s/n **112636**
Det. Mfr. & Model **Ludlum 43-37**	Det. Type **Gas proportional**	Det. s/n **110613**
Cal. Date **07 August 2012**	Due Date **07 August 2013**	Cal. Interval **1 year**

Environmental conditions: Temperature: **72°F** Relative Humidity **50%** Atmospheric Pressure **29.65** inches Hg
Pre-calibration Checks:

☒ Contamination survey	☒ Battery check	☒ Slow response check	
☒ Mechanical check	☐ Audio check	☒ Window operation	☒ Det. volts **1200** Vdc (@ 4.70)
☒ Meter zero	☒ Reset check	☒ Plateau check	
☐ Geotropism check	☒ Fast response check	☐ Alarm set	☒ Input sens. **13** mV (@ 1.50)

☒Pulse generator s/n 94926 ☐ Oscilloscope s/n 171-04928 ☒ Voltmeter s/n 57410002
☒HV Readout (2 points) Ref./Inst. **500 V/500 V** Ref./Inst. **1000 V/ 1000 V**

Comments: **Local background ≈ 4 cpm. Efficiency determined with detector at near contact with source, window OFF.**

S/N of source used for precision check **91TH470000**1Isotope **Th-230** Dedicated Source? ☐Yes ☒No
Reading #1 **5965** cpm Reading #2 **6053** cpm Reading #3 **6006** cpm Mean **6008** cpm
Precision: ☒± < 10% ☐± 10-20% ☐Out of tolerance

Range Multiplier	Reference Calibration Point	Instrument Indication
x 1K	400,000 cpm	400,000 cpm
x 1K	100,000 cpm	100,000 cpm
x 100	40,000 cpm	40,000 cpm
x 100	10,000 cpm	10,000 cpm
x 10	4,000 cpm	4,000 cpm
x 10	1,000 cpm	1,000 cpm
x 1	400 cpm	400 cpm
x 1	100 cpm	100 cpm
1 min. x 0.1	5,000 cpm (500 counts)	500 counts
1 min. x 1	5,000 cpm (5,000 counts)	5001 counts

All ranges calibrated electronically.

Range Multiplier	Cal. Source Used (isotope and S/N)	Source Activity (dpm)	Instrument Reading (cpm)	Instrument Efficiency (%)
1 min. count	Th-230 #91TH4700001	33,000	6008	18.2 %

RSA Laboratories ID# 15033. Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determinations is 1 cm unless otherwise specified. RSA Laboratories, Inc. certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

Calibrated by: Kurt D. Newton _____ Date: 07 August 2012

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(COUNTER/SCALER)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

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Customer Address: **P.O. Box 107, 19 Pendleton Drive, Hebron, CT 06248**

Inst. Mfr. & Model **Ludlum Model 2200**	Inst. Type **Scaler Ratemeter**	Inst. s/n **112636**
Det. Mfr. & Model **Ludlum 43-37**	Det. Type **Gas proportional**	Det. s/n **110613**
Cal. Date **13 August 2012**	Due Date **13 August 2013**	Cal. Interval **1 year**

Environmental conditions: Temperature: **72°F** Relative Humidity **46%** Atmospheric Pressure **29.62** inches Hg

Pre-calibration Checks:

☒ Contamination survey	☒ Battery check	☒ Slow response check	
☒ Mechanical check	☐ Audio check	☒ Window operation	☒ Det. volts **1280** Vdc (@ 5.00)
☒ Meter zero	☒ Reset check	☒ Plateau check	
☐ Geotropism check	☒ Fast response check	☐ Alarm set	☒ Input sens. **20** mV (@ 2.00)

☒Pulse generator s/n 94926 ☐ Oscilloscope s/n 171-04928 ☒ Voltmeter s/n 57410002
☒HV Readout (2 points) Ref./Inst. **500 V/500 V** Ref./Inst. **1000 V/ 1000 V**

Comments: **Local background ≈ 12 cpm. Efficiency determined with detector at near contact with source, window OFF. Replaced mylar in probe.**

S/N of source used for precision check **91TH470000**1Isotope **Th-230** Dedicated Source? ☐Yes ☒No
Reading #1 **5379** cpm Reading #2 **5515** cpm Reading #3 **5480** cpm Mean **5458** cpm
Precision: ☒± <10% ☐±10-20% ☐Out of tolerance

Range Multiplier	Reference Calibration Point	Instrument Indication
x 1K	400,000 cpm	400,000 cpm
x 1K	100,000 cpm	100,000 cpm
x 100	40,000 cpm	40,000 cpm
x 100	10,000 cpm	10,000 cpm
x 10	4,000 cpm	4,000 cpm
x 10	1,000 cpm	1,000 cpm
x 1	400 cpm	400 cpm
x 1	100 cpm	100 cpm
1 min. x 0.1	5,000 cpm (500 counts)	500 counts
1 min. x 1	5,000 cpm (5,000 counts)	5000 counts

All ranges calibrated electronically.

Range Multiplier	Cal. Source Used (isotope and S/N)	Source Activity (dpm)	Instrument Reading (cpm)	Instrument Efficiency (%)
1 min. count	Th-230 #91TH4700001	33,000	5458	16.5 %

RSA Laboratories ID# 15043. Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determinations is 1 cm unless otherwise specified. RSA Laboratories, Inc. certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

Calibrated by: **Kurt D. Newton** Date: **13 August 2012**

Attachment A

CERTIFICATE OF CALIBRATION
(COUNT-RATE INSTRUMENT)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Radiation Safety Associates, Inc. Attn: K. Paul Steinmeyer (860) 228-0487**
Customer Address: **P.O. Box 107, 19 Pendleton Drive, Hebron, CT 06248**

Inst. Mfr. & Model **Eberline Model MS-2**	Inst. Type **Scaler/Ratemeter**	Inst. s/n **794**
Det. Mfr. & Model **Ludlum Model 43-37**	Det. Type **Gas Proportional**	Det. s/n **160827**
Cal. Date **06 August 2012**	Due Date **06 August 2013**	Cal. Interval **1 year**

Environmental conditions: Temperature: **72°F** Relative Humidity **48%** Atmospheric Pressure **29.70** inches Hg

Pre-calibration Checks:

☒ Contamination survey	☐ Battery check	☒ Slow response check	
☒ Mechanical check	☐ Audio check	☐ Window operation	☒ Det. volts 1200 Vdc
☒ Meter zero	☒ Reset check	☒ Plateau check	
☒ Geotropism check	☒ Fast response check	☐ Alarm set	☒ Input sens. 3 mV

☒ Pulse generator s/n 94926 ☐ Oscilloscope s/n 171-04928 ☒ Voltmeter s/n 57410002
☒ HV Readout (2 points) Ref./Inst. 900 V/ 900 V Ref./Inst. 1700 V/ 1700 V

Comments: *** Threshold set to 5.00; HV set to 7.70; Window set to OUT; Test set to OFF. Local background ≈ 4 cpm alpha. Th-230 efficiency measured on contact. Used as hand-held detector. Calibrated using AC line power.**

S/N of source used for precision check **#91TH470000**Isotope **Th-230** Dedicated Source? ☐Yes ☒No
Reading #1 **5,809 cpm** Reading #2 **6,000 cpm** Reading #3 **5,929 cpm** Mean **5,913 cpm**
Precision: ☒± <10% ☐±10-20% ☐Out of tolerance

Range Multiplier	Reference Calibration Point	Instrument Indication
x 1K	400,000 cpm	400,000 cpm
x 1K	100,000 cpm	100,000 cpm
x 100	40,000 cpm	40,000 cpm
x 100	10,000 cpm	10,000 cpm
x 10	4000 cpm	4000 cpm
x 10	1000 cpm	1000 cpm
x 1	400 cpm	400 cpm
x 1	100 cpm	100 cpm
20 (2 x 10) minutes	1,000 cpm	20,012 cpm
10 (1 x 10) minutes	1,000 cpm	10,005 cpm
5 (5 x 1) minutes	1,000 cpm	5,002 cpm
2 (2 x 1) minutes	1,000 cpm	2,000 cpm
1 (1 x 1) minutes	1,000 cpm	1,000 cpm
0.5 (5 x .1) minutes	1,000 cpm	500 cpm
0.2 (2 x .1) minutes	1,000 cpm	200 cpm
0.1 (1 x .1) minutes	1,000 cpm	100 cpm

All ranges calibrated electronically.

Range Multiplier	Cal. Source Used (isotope and S/N)	Source Activity (dpm)	Instrument Reading (cpm)	4π Instrument Efficiency (%)
1 min. count	Th-230 #91TH4700001	33,000	5,913 (α)	17.9%

RSA Laboratories ID# **15029**. Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determinations is 1 cm unless otherwise specified. RSA Laboratories, Inc. certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

Calibrated by: **Kurt D. Newton** Date: **06 August 2012**

Attachment A

CERTIFICATE OF CALIBRATION
(COUNT-RATE INSTRUMENT)

RSA Laboratories, Inc.
19 Pendleton Drive, P.O. Box 61
Hebron, Connecticut 06248
(860) 228-0721 Fax (860) 228-4402

Customer and Contact: **Radiation Safety Associates, Inc. Attn: K. Paul Steinmeyer (860) 228-0487**
Customer Address: **P.O. Box 107, 19 Pendleton Drive, Hebron, CT 06248**

Inst. Mfr. & Model **Eberline Model MS-2**	Inst. Type **Scaler/Ratemeter**	Inst. s/n **795**
Det. Mfr. & Model **Ludlum Model 43-37**	Det. Type **Gas Proportional**	Det. s/n **113573**
Cal. Date **06 August 2012**	Due Date **06 August 2013**	Cal. Interval **1 year**

Environmental conditions: Temperature: **72°F** Relative Humidity **48%** Atmospheric Pressure **29.70** inches Hg

Pre-calibration Checks:

☒ Contamination survey	☐ Battery check	☒ Slow response check	
☒ Mechanical check	☐ Audio check	☐ Window operation	☒ Det. volts **1200** Vdc
☒ Meter zero	☒ Reset check	☒ Plateau check	
☒ Geotropism check	☒ Fast response check	☐ Alarm set	☒ Input sens. **3** mV

☒ Pulse generator s/n **94926** ☐ Oscilloscope s/n **171-04928** ☒ Voltmeter s/n **57410002**
☒ HV Readout (2 points) Ref./Inst. **900 V/ 900 V** Ref./Inst. **1700 V/ 1700 V**

Comments: *** Threshold set to 5.00; HV set to 6.80; Window set to OUT; Test set to OFF. Local background ≈ 5 cpm alpha. Th-230 efficiency measured on contact. Used as hand-held detector. Calibrated using AC line power.**

S/N of source used for precision check **#91TH4700001** Isotope **Th-230** Dedicated Source? ☐Yes ☒No
Reading #1 **5,626** cpm Reading #2 **6,115** cpm Reading #3 **6,004** cpm Mean **5,915** cpm
Precision: ☒± <10% ☐±10-20% ☐Out of tolerance

Range Multiplier	Reference Calibration Point	Instrument Indication
x 1K	400,000 cpm	400,000 cpm
x 1K	100,000 cpm	100,000 cpm
x 100	40,000 cpm	40,000 cpm
x 100	10,000 cpm	10,000 cpm
x 10	4000 cpm	4000 cpm
x 10	1000 cpm	1000 cpm
x 1	400 cpm	400 cpm
x 1	100 cpm	100 cpm
20 (2 x 10) minutes	1,000 cpm	20,015 cpm
10 (1 x 10) minutes	1,000 cpm	10,006 cpm
5 (5 x 1) minutes	1,000 cpm	5,002 cpm
2 (2 x 1) minutes	1,000 cpm	2,001 cpm
1 (1 x 1) minutes	1,000 cpm	1,000 cpm
0.5 (5 x .1) minutes	1,000 cpm	500 cpm
0.2 (2 x .1) minutes	1,000 cpm	200 cpm
0.1 (1 x .1) minutes	1,000 cpm	100 cpm

All ranges calibrated electronically.

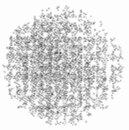
Range Multiplier	Cal. Source Used (isotope and S/N)	Source Activity (dpm)	Instrument Reading (cpm)	4π Instrument Efficiency (%)
1 min. count	Th-230 #91TH4700001	33,000	5,915 (α)	17.9%

RSA Laboratories ID# **15028**. Instrument indicates within ±10% of calibration points unless otherwise indicated. Source-to-detector entry window distance for efficiency determinations is 1 cm unless otherwise specified. RSA Laboratories, Inc. certifies that the above instrument has been calibrated with standards traceable to the National Institute of Standards and Technology, or have been derived from accepted values of natural physical constants, or have been derived by the ratio-type of calibration techniques.

Calibrated by: **Kurt D. Newton** Date: **06 August 2012**

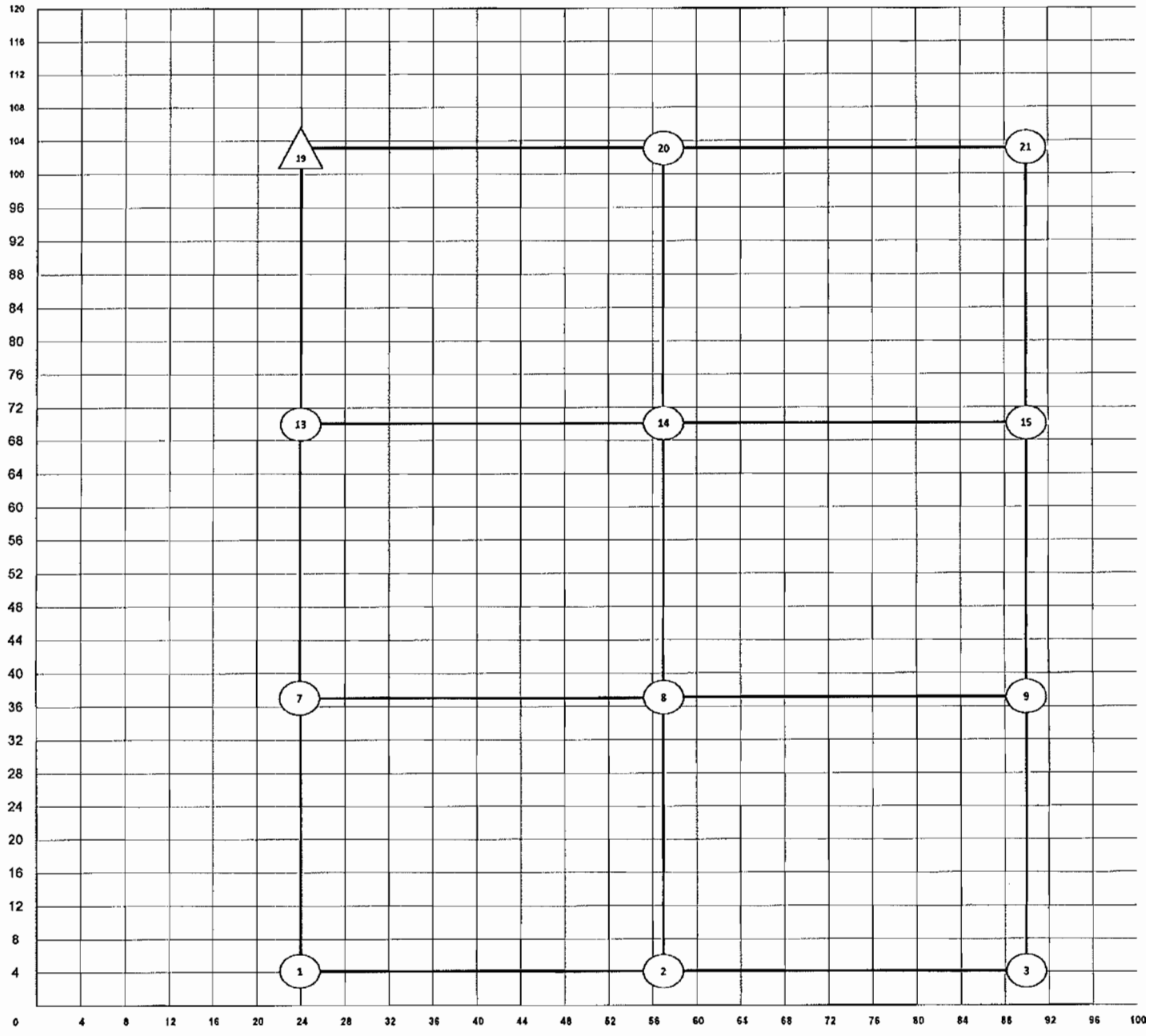
Attachment B

MARSSIM-required Sample Locations by Survey Unit Including Random Start Points

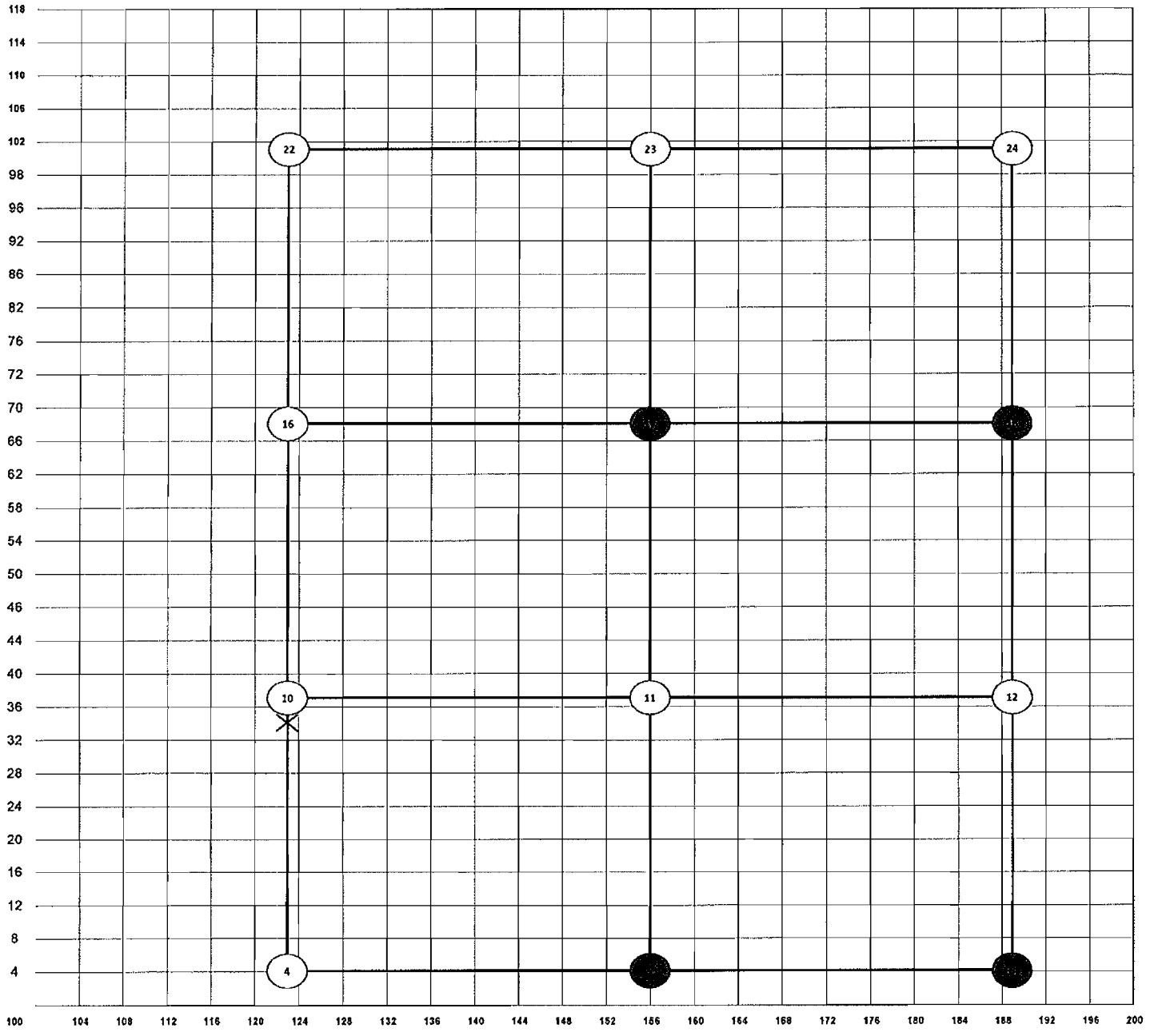


A shaded circle indicates a MARSSIM-determined survey point that couldn't be used because the concrete floor had been removed during PCB remediation.

Pratt & Whitney Building 10 Survey Unit 1 PAGE 1

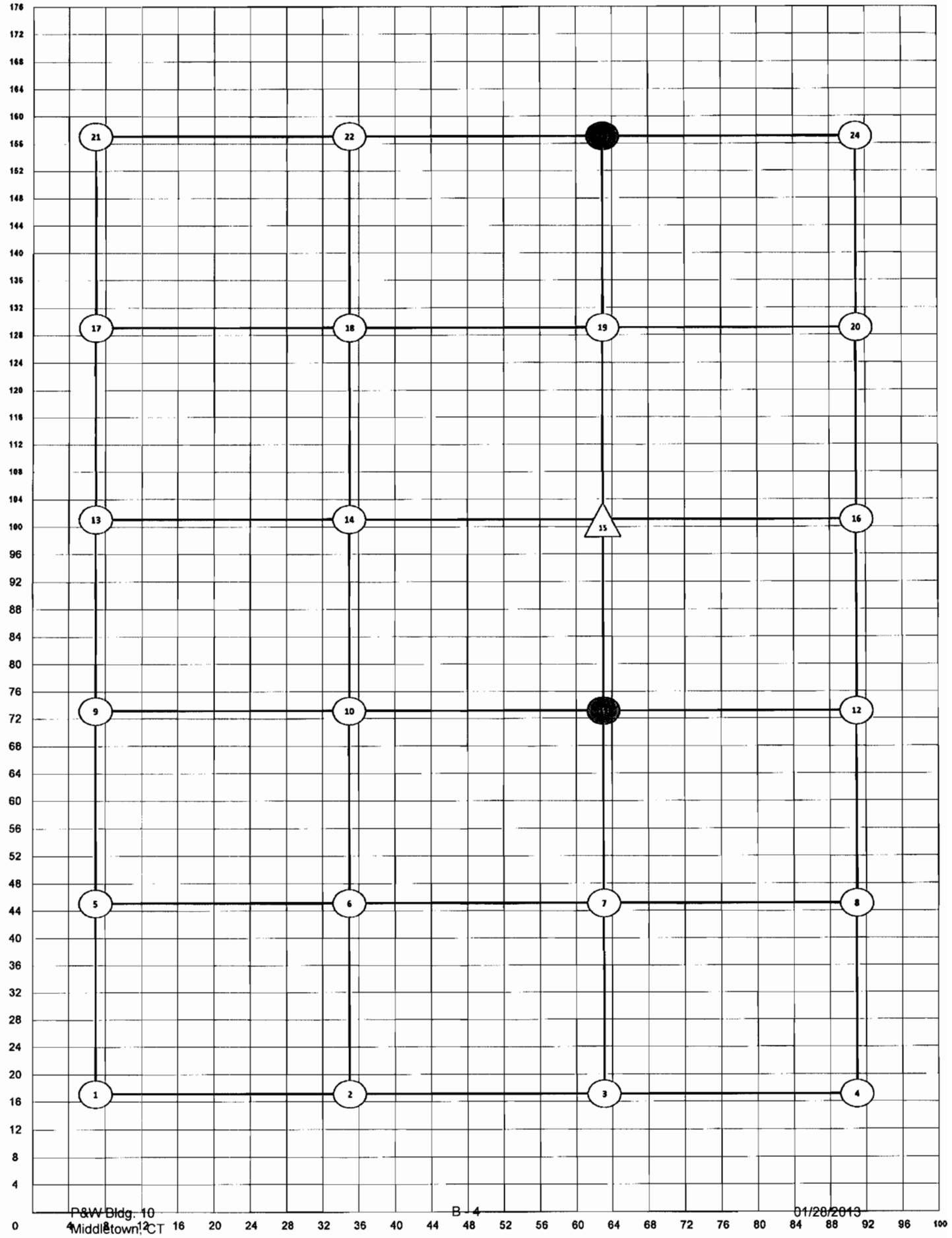


Pratt & Whitney Building 10 Survey Unit 1 PAGE 2



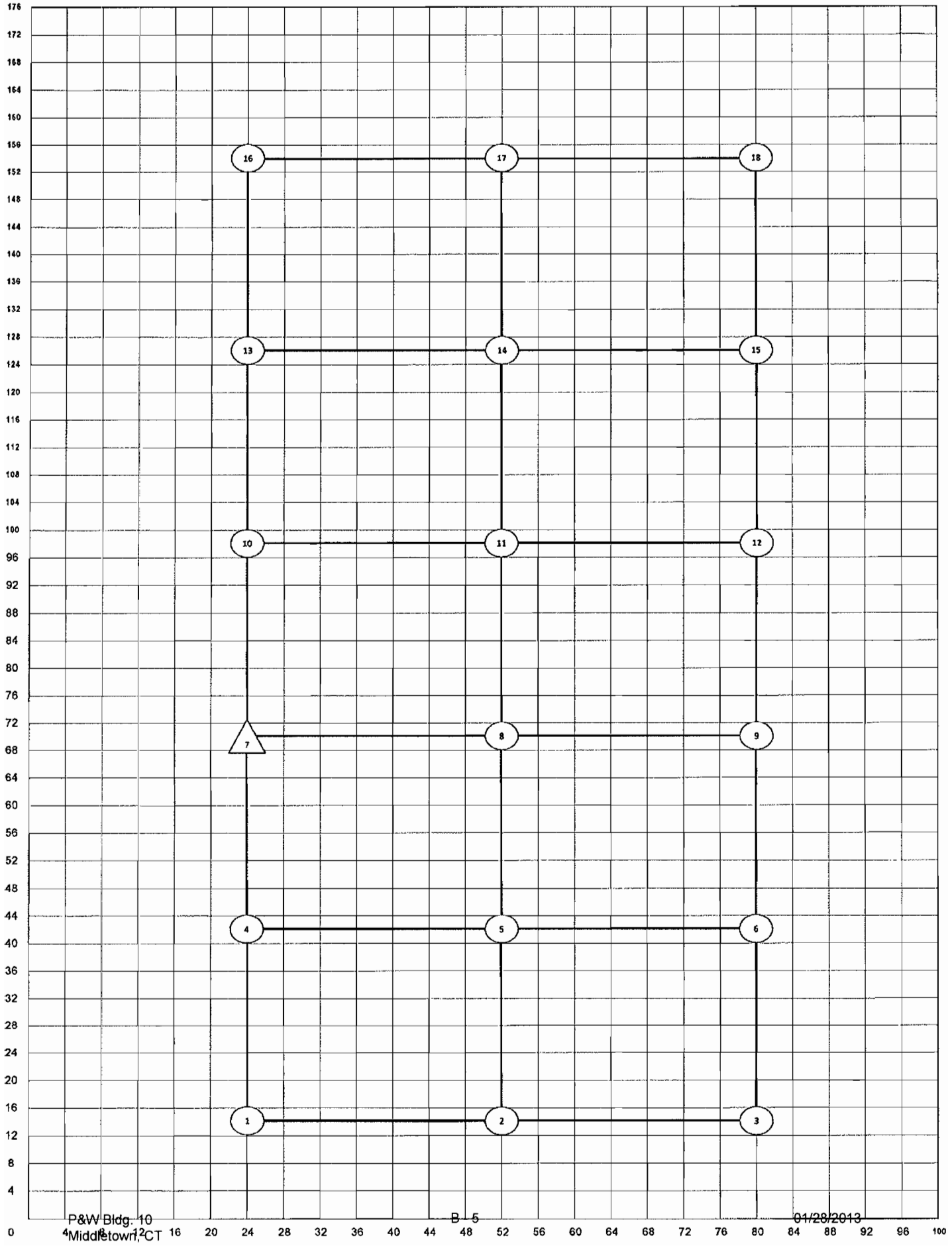
Pratt & Whitney Building 10 Survey Unit 2

Attachment B



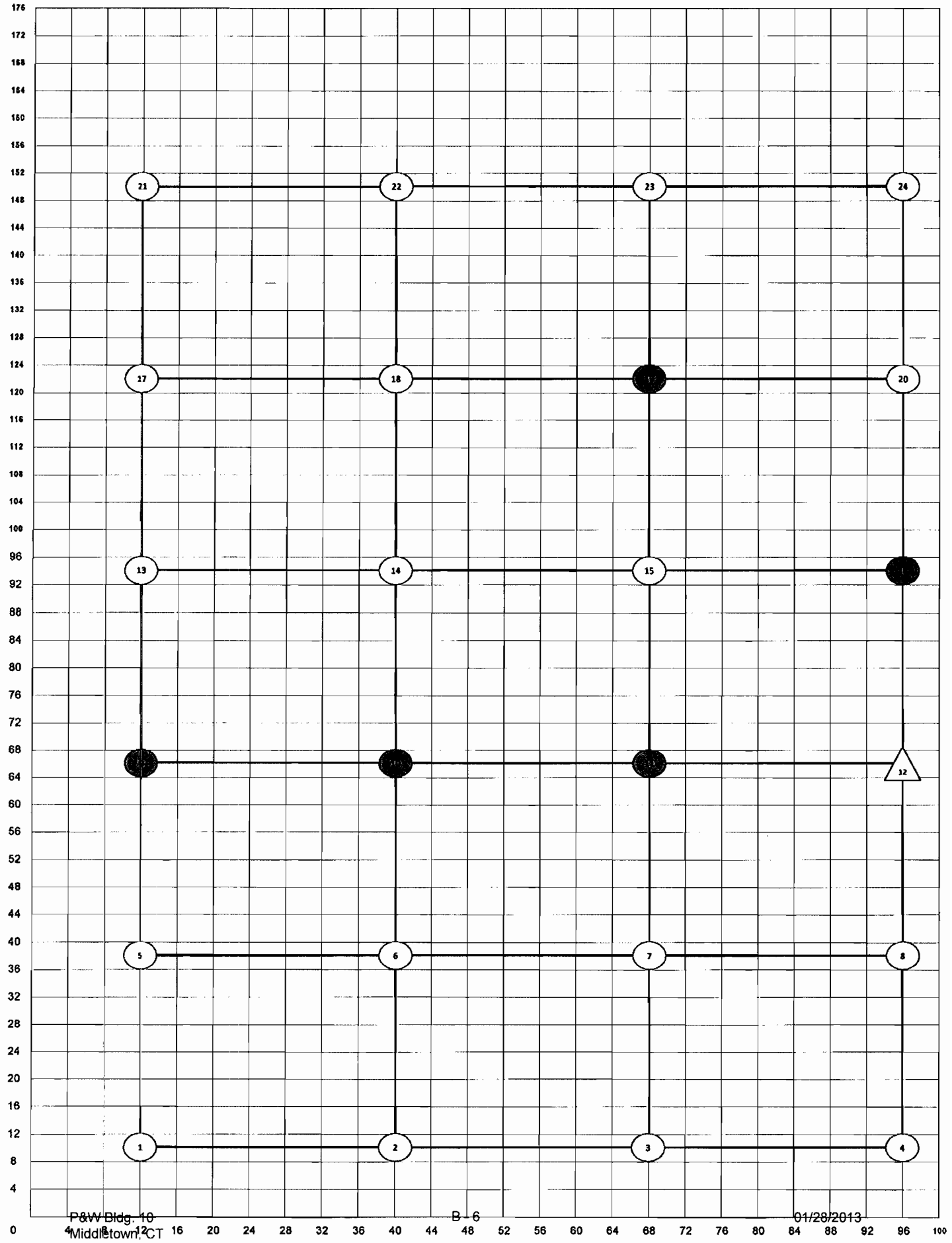
Pratt & Whitney Building 10 Survey Unit 3

Attachment B



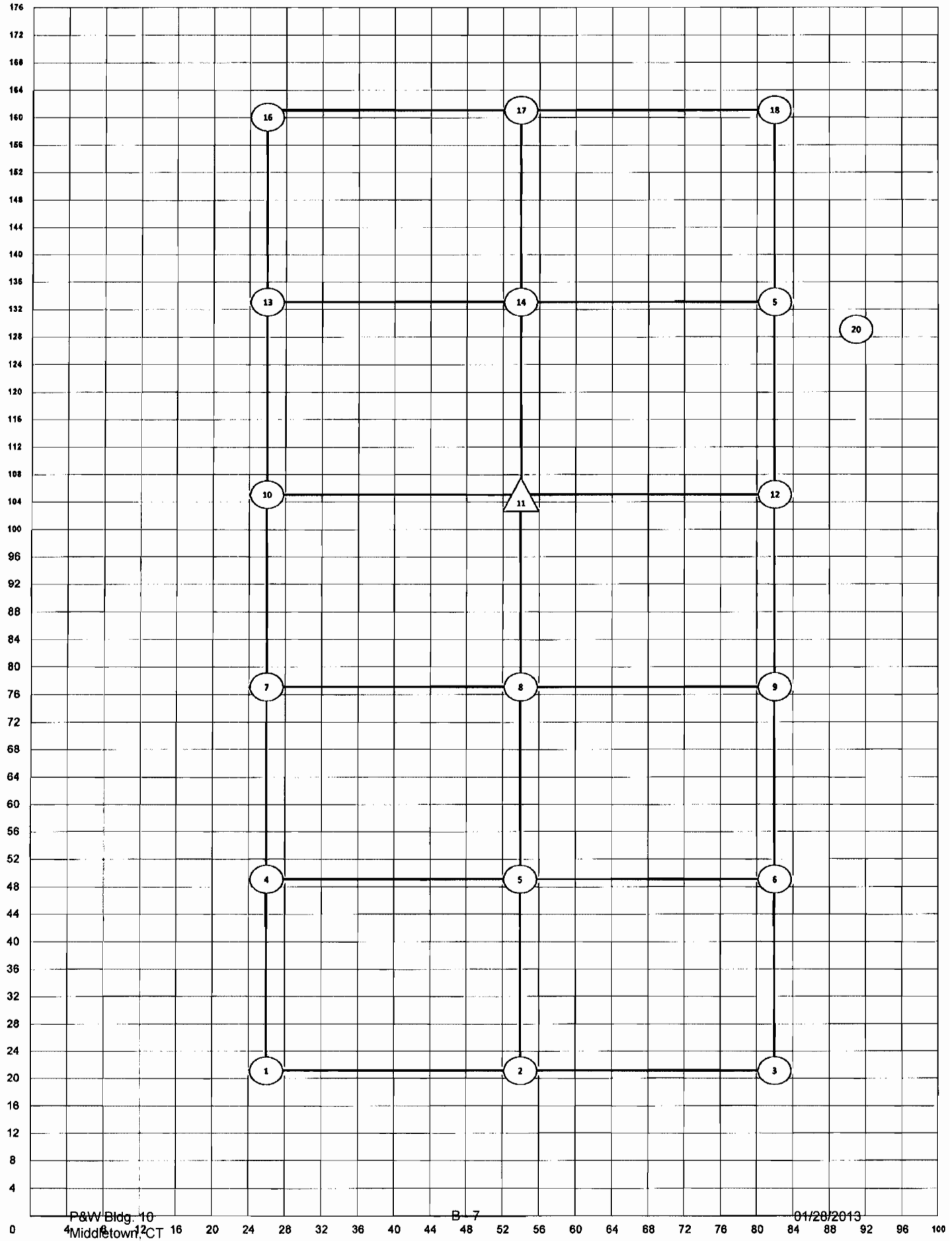
Pratt & Whitney Building 10 Survey Unit 4

Attachment B

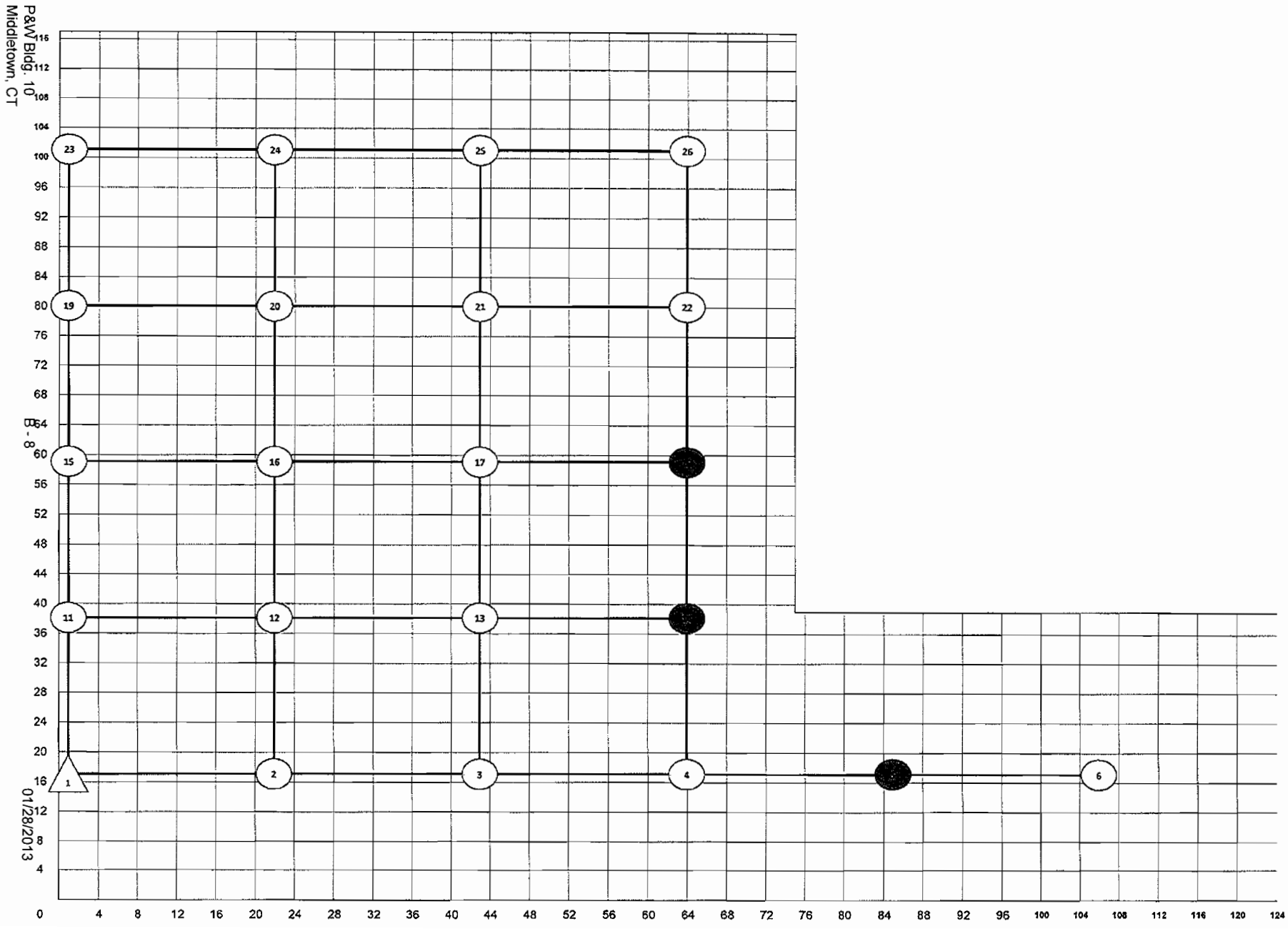


Pratt & Whitney Building 10 Survey Unit 5

Attachment B

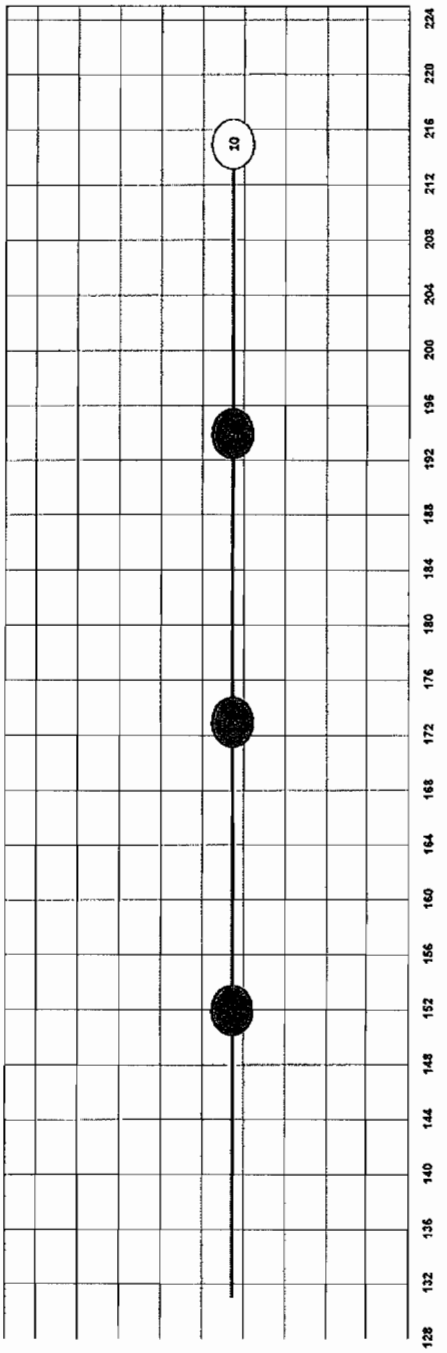


Pratt & Whitney Building 10 Survey Unit 6 PAGE 1



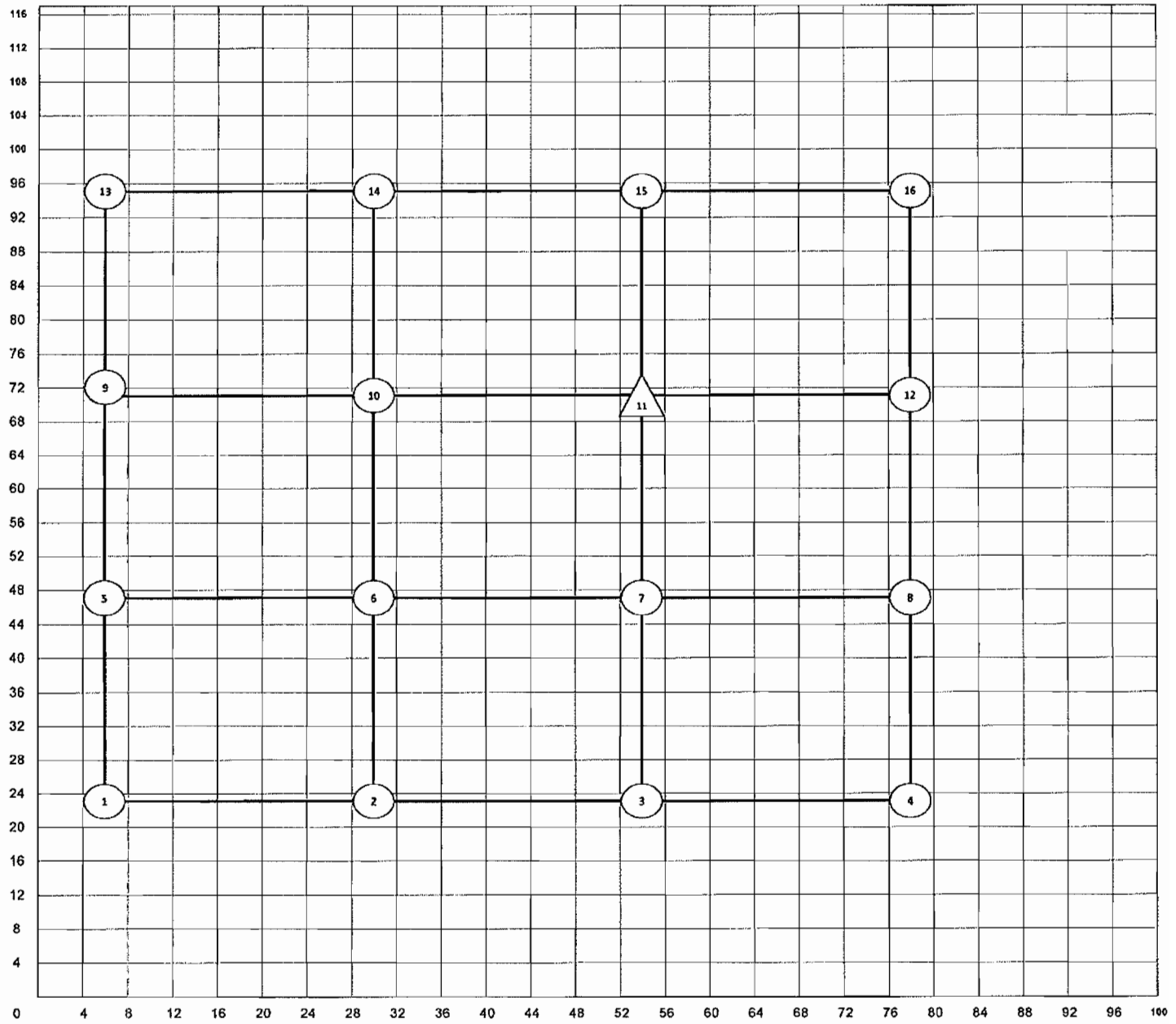
Attachment B

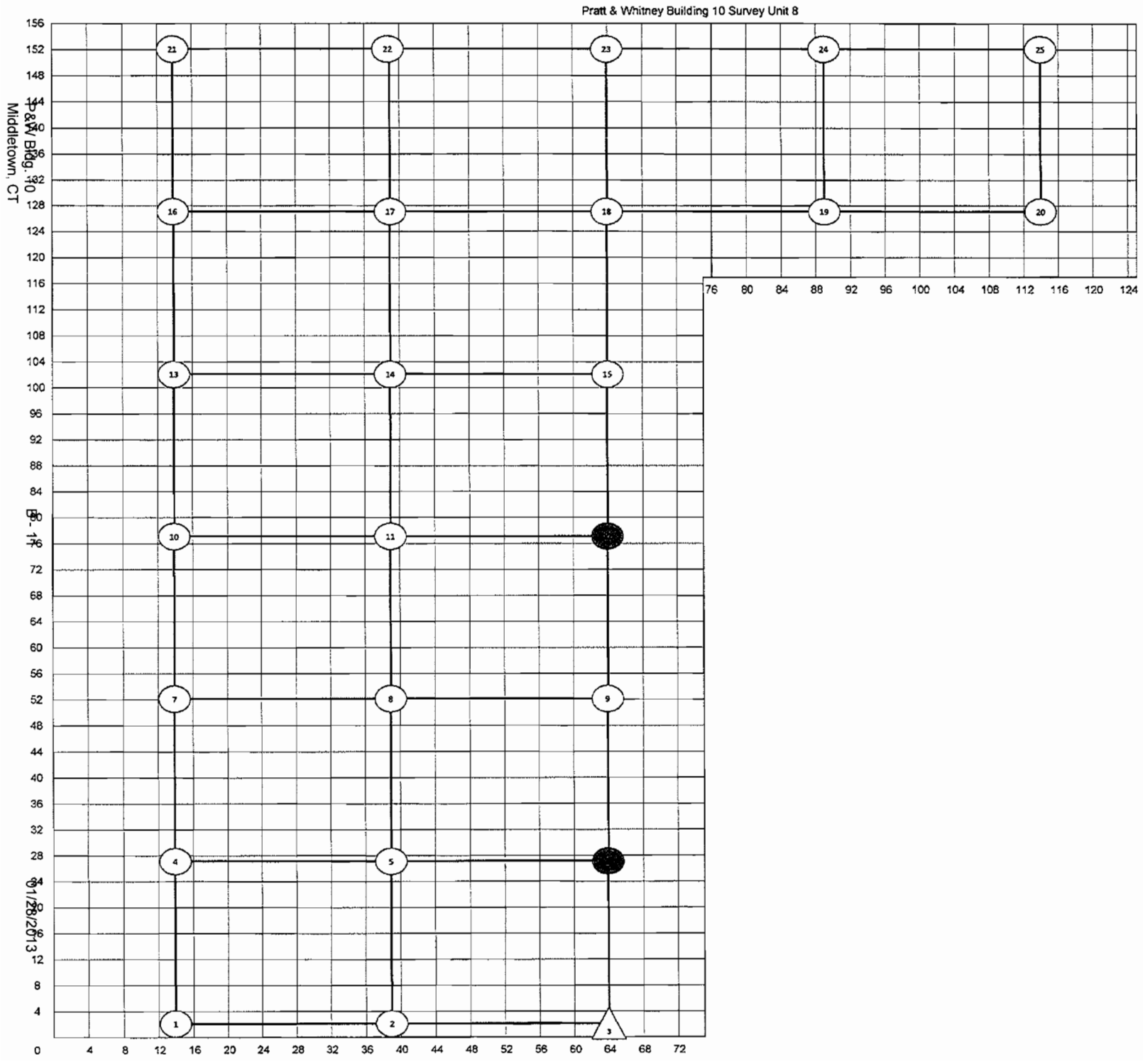
Pratt & Whitney Building 10 Survey Unit 6 PAGE 2



Attachment B

Pratt & Whitney Building 10 Survey Unit 7

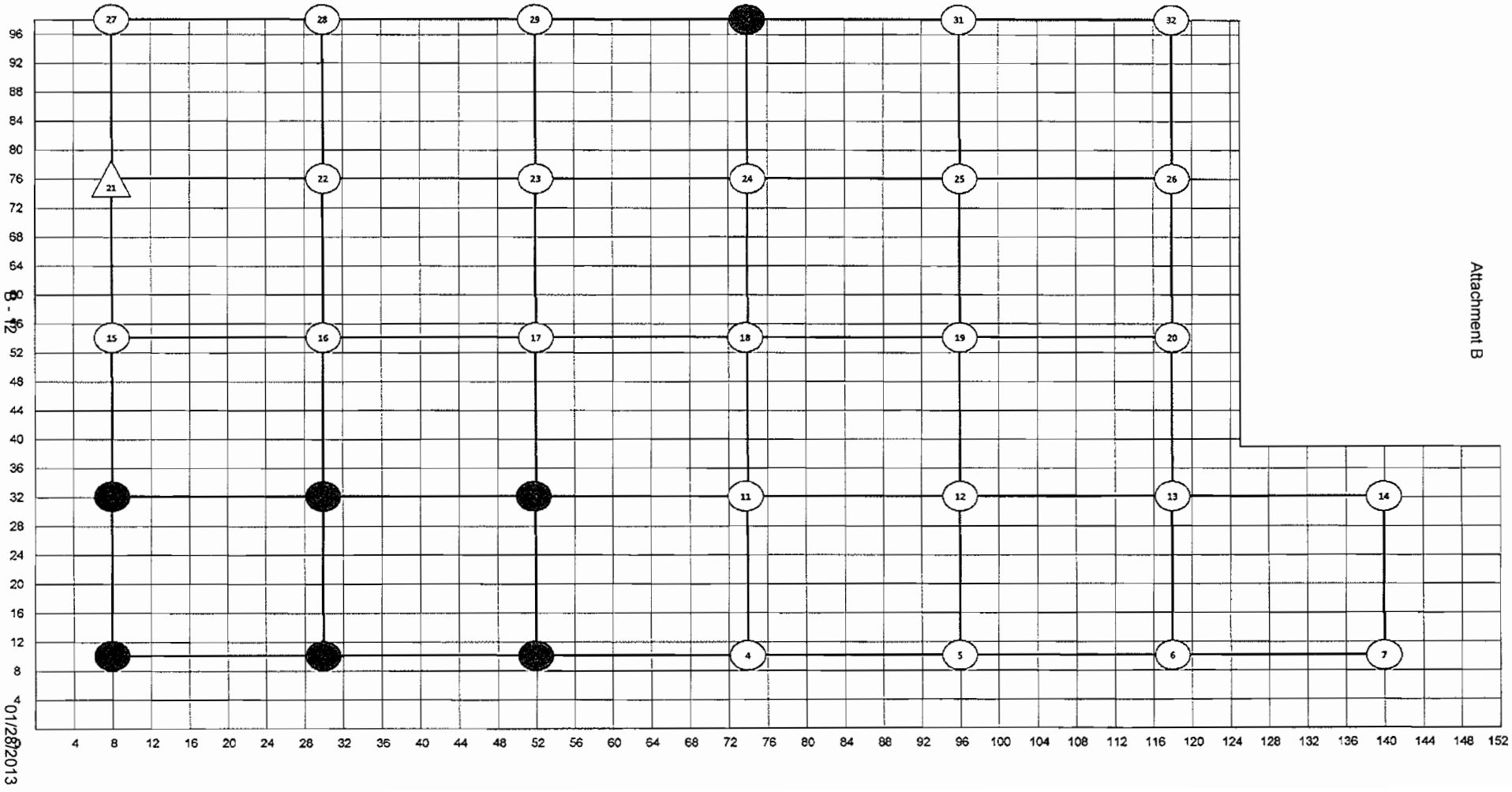




Attachment B

P&W Bldg. 10
Middletown, CT

Pratt & Whitney Building 10 Survey Unit 9



Attachment B

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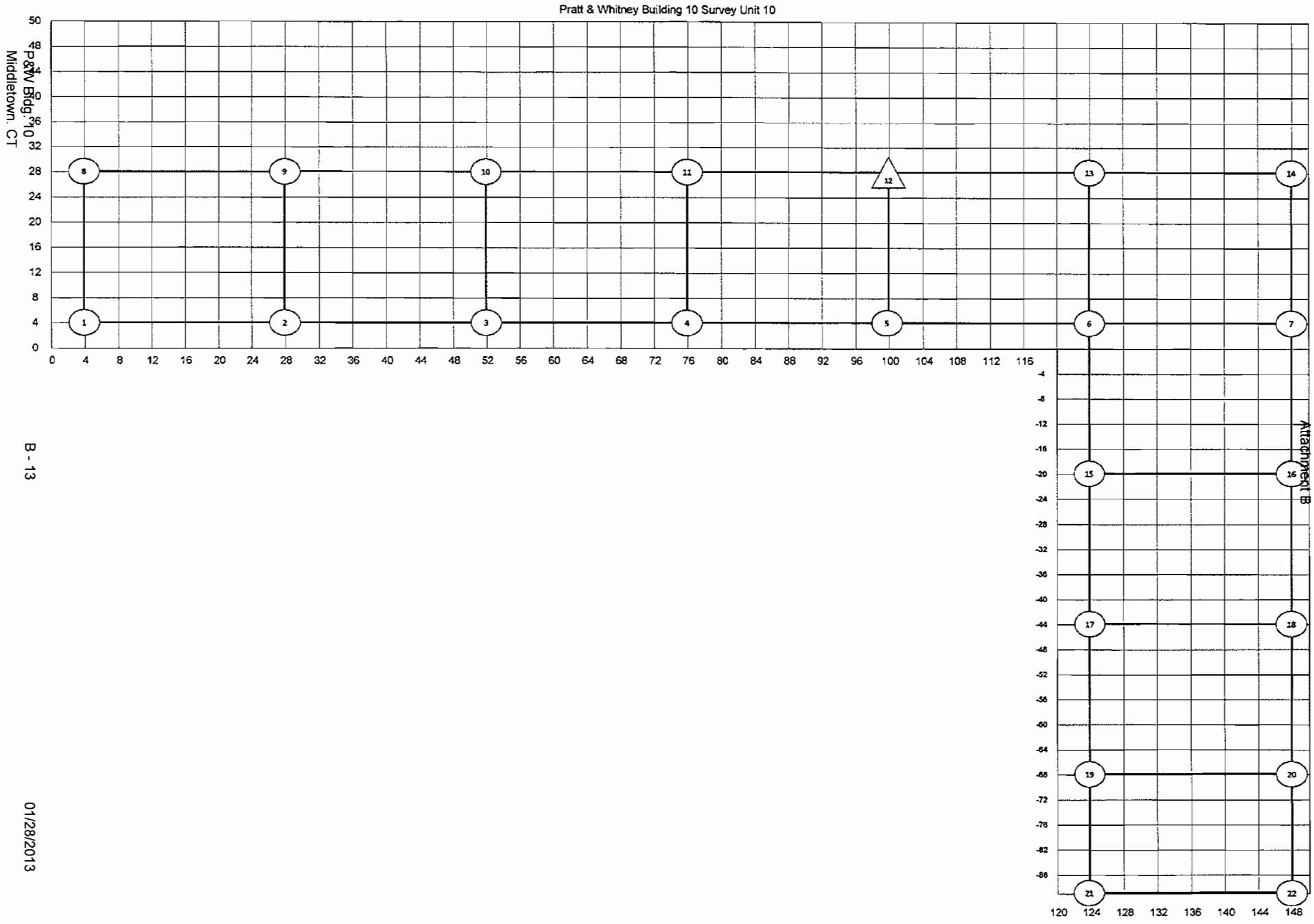

Attachment B

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01/28/2013

Attachment C

Final Status Wipe Survey Results–

Survey Units 1 through 10

P&W Bldg. 10
Middletown, CT

RSA Laboratories Inc.

Radiochemistry Analysis Data Sheet

Attachment C

Report No. **32455P&W**

Customer: **Pratt & Whitney Middletown**

Customer Samp No. **SU1-01 - SU1-20**

Location: **Survey Unit 1**

RSA Lab Sample No. **32455**

Project: **Building 10 Decommissioning**

Date Collected: **N/A**

Samp. Description: **Wipes**

Date Counted: **8/15/2012**

Matrix: **Wipes**

RSA ID#	CUST. ID#		ALPHA CPM	ALPHA DPM	ALPHA LLD	BETA CPM	BETA DPM	BETA LLD
BACKGROUND			0.07					
32455-1	SU1-1	Survey Unit 1 Point 1	0.14	0.17	0.44			
32455-2	SU1-2	Survey Unit 1 Point 2	0.19	0.23	0.44			
32455-3	SU1-3	Survey Unit 1 Point 3	0.19	0.23	0.44			
32455-4	SU1-4	Survey Unit 1 Point 4	-0.07	-0.09	0.44			
32455-5	SU1-5	Survey Unit 1 Point 7	0.19	0.23	0.44			
32455-6	SU1-6	Survey Unit 1 Point 8	0.03	0.04	0.44			
32455-7	SU1-7	Survey Unit 1 Point 9	-0.02	-0.03	0.44			
32455-8	SU1-8	Survey Unit 1 Point 10	0.35	0.42	0.44			
32455-9	SU1-9	Survey Unit 1 Point 11	0.14	0.17	0.44			
32455-10	SU1-10	Survey Unit 1 Point 12	0.19	0.23	0.44			
32455-11	SU1-11	Survey Unit 1 Point 13	0.14	0.17	0.44			
32455-12	SU1-12	Survey Unit 1 Point 14	0.03	0.04	0.44			
32455-13	SU1-13	Survey Unit 1 Point 15	0.14	0.17	0.44			
32455-14	SU1-14	Survey Unit 1 Point 16	0.14	0.17	0.44			
32455-15	SU1-15	Survey Unit 1 Point 19	-0.02	-0.03	0.44			
32455-16	SU1-16	Survey Unit 1 Point 20	-0.02	-0.03	0.44			
32455-17	SU1-17	Survey Unit 1 Point 21	-0.02	-0.01	0.44			
32455-18	SU1-18	Survey Unit 1 Point 22	-0.02	-0.01	0.44			
32455-19	SU1-19	Survey Unit 1 Point 23	-0.07	-0.05	0.44			
32455-20	SU1-20	Survey Unit 1 Point 24	0.14	0.08	0.44			

Jay R. Dockendorff
Laboratory Director

01/28/2013

P&W Bldg. 10
Middletown. CT

RSA Laboratories Inc.

Radiochemistry Analysis Data Sheet

Attachment C

Report No. **32456P&W**

Customer: **Pratt & Whitney Middletown**

Customer Samp No. **SU2-01 - SU2-22**

Location: **Survey Unit 2**

RSA Lab Sample No. **32456**

Project: **Building 10 Decommissioning**

Date Collected: **N/A**

Samp. Description: **Wipes**

Date Counted: **8/16/2012**

Matrix: **Wipes**

RSA ID#	CUST. ID#		ALPHA CPM	ALPHA DPM	ALPHA LLD	BETA CPM	BETA DPM	BETA LLD
BACKGROUND			0.07					
32456-1	SU2-1	Survey Unit 2 Point 1	0.03	0.04	0.44			
32456-2	SU2-2	Survey Unit 2 Point 2	0.14	0.17	0.44			
32456-3	SU2-3	Survey Unit 2 Point 3	0.03	0.04	0.44			
32456-4	SU2-4	Survey Unit 2 Point 4	-0.02	-0.03	0.44			
32456-5	SU2-5	Survey Unit 2 Point 5	0.14	0.17	0.44			
32456-6	SU2-6	Survey Unit 2 Point 6	0.03	0.04	0.44			
32456-7	SU2-7	Survey Unit 2 Point 7	0.03	0.04	0.44			
32456-8	SU2-8	Survey Unit 2 Point 8	0.08	0.10	0.44			
32456-9	SU2-9	Survey Unit 2 Point 9	0.24	0.30	0.44			
32456-10	SU2-10	Survey Unit 2 Point 10	0.35	0.42	0.44			
32456-11	SU2-11	Survey Unit 2 Point 12	0.19	0.23	0.44			
32456-12	SU2-12	Survey Unit 2 Point 13	0.03	0.04	0.44			
32456-13	SU2-13	Survey Unit 2 Point 14	0.19	0.23	0.44			
32456-14	SU2-14	Survey Unit 2 Point 15	0.08	0.10	0.44			
32456-15	SU2-15	Survey Unit 2 Point 16	0.08	0.10	0.44			
32456-16	SU2-16	Survey Unit 2 Point 17	0.08	0.10	0.44			
32456-17	SU2-17	Survey Unit 2 Point 18	0.03	0.02	0.44			
32456-18	SU2-18	Survey Unit 2 Point 19	0.19	0.12	0.44			
32456-19	SU2-19	Survey Unit 2 Point 20	0.19	0.12	0.44			
32456-20	SU2-20	Survey Unit 2 Point 21	0.35	0.21	0.44			
32456-21	SU2-21	Survey Unit 2 Point 22	0.19	0.12	0.44			
32456-22	SU2-22	Survey Unit 2 Point 24	0.14	0.08	0.44			

Jay R. Dockendorff
Laboratory Director

01/28/2013

P&W Bldg. 10
Middletown, CT

RSA Laboratories Inc.

Radiochemistry Analysis Data Sheet

Attachment C

Report No. **32457P&W**

Customer: **Pratt & Whitney Middletown**

Customer Samp No. **SU3-01 - SU3-18**

Location: **Survey Unit 3**

RSA Lab Sample No. **32457**

Project: **Building 10 Decommissioning**

Date Collected: **N/A**

Samp. Description: **Wipes**

Date Counted: **8/17/2012**

Matrix: **Wipes**

RSA ID#	CUST. ID#		ALPHA CPM	ALPHA DPM	ALPHA LLD	BETA CPM	BETA DPM	BETA LLD
BACKGROUND			0.07					
32457-01	SU3-1	Survey Unit 3 Point 1	0.14	0.17	0.44			
32457-02	SU3-2	Survey Unit 3 Point 2	-0.02	-0.03	0.44			
32457-03	SU3-3	Survey Unit 3 Point 3	0.19	0.23	0.44			
32457-04	SU3-4	Survey Unit 3 Point 4	0.03	0.04	0.44			
32457-05	SU3-5	Survey Unit 3 Point 5	0.03	0.04	0.44			
32457-06	SU3-6	Survey Unit 3 Point 6	0.03	0.04	0.44			
32457-07	SU3-7	Survey Unit 3 Point 7	0.24	0.30	0.44			
32457-08	SU3-8	Survey Unit 3 Point 8	0.19	0.23	0.44			
32457-09	SU3-9	Survey Unit 3 Point 9	0.35	0.42	0.44			
32457-10	SU3-10	Survey Unit 3 Point 10	0.35	0.42	0.44			
32457-11	SU3-11	Survey Unit 3 Point 11	0.24	0.30	0.44			
32457-12	SU3-12	Survey Unit 3 Point 12	0.19	0.23	0.44			
32457-13	SU3-13	Survey Unit 3 Point 13	0.14	0.17	0.44			
32457-14	SU3-14	Survey Unit 3 Point 14	0.08	0.10	0.44			
32457-15	SU3-15	Survey Unit 3 Point 15	0.24	0.30	0.44			
32457-16	SU3-16	Survey Unit 3 Point 16	0.03	0.04	0.44			
32457-17	SU3-17	Survey Unit 3 Point 17	0.30	0.36	0.44			
32457-18	SU3-18	Survey Unit 3 Point 18	0.08	0.10	0.44			

Jay R. Dockendorff
Laboratory Director

01/28/2013

P&W Bldg. 10
Middletown, CT

RSA Laboratories Inc.
Radiochemistry Analysis Data Sheet

Attachment C

Report No. **32458P&W**

Customer: **Pratt & Whitney Middletown**

Customer Samp No. **SU4-01 - SU4-19**

Location: **Survey Unit 4 REFERENCE AREA**

RSA Lab Sample No. **32458**

Project: **Building 10 Decommissioning**

Date Collected: **N/A**

Samp. Description: **Wipes**

Date Counted: **8/17/2012**

Matrix: **Wipes**

RSA ID#	CUST. ID#		ALPHA CPM	ALPHA DPM	ALPHA LLD	BETA CPM	BETA DPM	BETA LLD
BACKGROUND			0.07					
32458-01	SU4-1	Survey Unit 4 Point 1	0.14	0.17	0.44			
32458-02	SU4-2	Survey Unit 4 Point 2	0.08	0.10	0.44			
32458-03	SU4-3	Survey Unit 4 Point 3	-0.02	-0.03	0.44			
32458-04	SU4-4	Survey Unit 4 Point 4	0.14	0.17	0.44			
32458-05	SU4-5	Survey Unit 4 Point 5	0.08	0.10	0.44			
32458-06	SU4-6	Survey Unit 4 Point 6	0.08	0.10	0.44			
32458-07	SU4-7	Survey Unit 4 Point 7	0.03	0.04	0.44			
32458-08	SU4-8	Survey Unit 4 Point 8	-0.02	-0.03	0.44			
32458-09	SU4-9	Survey Unit 4 Point 12	0.03	0.04	0.44			
32458-10	SU4-10	Survey Unit 4 Point 13	0.19	0.23	0.44			
32458-11	SU4-11	Survey Unit 4 Point 14	0.03	0.04	0.44			
32458-12	SU4-12	Survey Unit 4 Point 15	0.30	0.36	0.44			
32458-13	SU4-13	Survey Unit 4 Point 17	-0.02	-0.03	0.44			
32458-14	SU4-14	Survey Unit 4 Point 18	-0.02	-0.03	0.44			
32458-15	SU4-15	Survey Unit 4 Point 20	0.19	0.23	0.44			
32458-16	SU4-16	Survey Unit 4 Point 21	0.30	0.36	0.44			
32458-17	SU4-17	Survey Unit 4 Point 22	-0.02	-0.03	0.44			
32458-18	SU4-18	Survey Unit 4 Point 23	0.19	0.23	0.44			
32458-19	SU4-19	Survey Unit 4 Point 24	0.30	0.36	0.44			

Jay R. Dockendorff
Laboratory Director

01/28/2013

P&W Bldg. 10
Middletown, CT

RSA Laboratories Inc.

Radiochemistry Analysis Data Sheet

Attachment C

Report No. **32459P&W**

Customer: **Pratt & Whitney Middletown**

Customer Samp No. **SU5-01 - SU5-18**

Location: **Survey Unit 5**

RSA Lab Sample No. **32459**

Project: **Building 10 Decommissioning**

Date Collected: **N/A**

Samp. Description: **Wipes**

Date Counted: **8/17/2012**

Matrix: **Wipes**

RSA ID#	CUST. ID#		ALPHA CPM	ALPHA DPM	ALPHA LLD	BETA CPM	BETA DPM	BETA LLD
32459-01			0.07					
32459-01	SU5-1	Survey Unit 5 Point 1	-0.02	-0.03	0.44			
32459-02	SU5-2	Survey Unit 5 Point 2	0.24	0.30	0.44			
32459-03	SU5-3	Survey Unit 5 Point 3	0.03	0.04	0.44			
32459-04	SU5-4	Survey Unit 5 Point 4	0.03	0.04	0.44			
32459-05	SU5-5	Survey Unit 5 Point 5	-0.07	-0.09	0.44			
32459-06	SU5-6	Survey Unit 5 Point 6	0.03	0.04	0.44			
32459-07	SU5-7	Survey Unit 5 Point 7	-0.02	-0.03	0.44			
32459-08	SU5-8	Survey Unit 5 Point 8	-0.02	-0.03	0.44			
32459-09	SU5-9	Survey Unit 5 Point 9	0.08	0.10	0.44			
32459-10	SU5-10	Survey Unit 5 Point 10	0.30	0.36	0.44			
32459-11	SU5-11	Survey Unit 5 Point 11	-0.02	-0.03	0.44			
32459-12	SU5-12	Survey Unit 5 Point 12	0.24	0.30	0.44			
32459-13	SU5-13	Survey Unit 5 Point 13	0.30	0.36	0.44			
32459-14	SU5-14	Survey Unit 5 Point 14	0.14	0.17	0.44			
32459-15	SU5-15	Survey Unit 5 Point 15	0.03	0.04	0.44			
32459-16	SU5-16	Survey Unit 5 Point 16	0.03	0.04	0.44			
32459-17	SU5-17	Survey Unit 5 Point 17	0.19	0.12	0.44			
32459-18	SU5-18	Survey Unit 5 Point 18	0.19	0.12	0.44			

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P&W Bldg. 10
Middletown, CT

RSA Laboratories Inc.
Radiochemistry Analysis Data Sheet

Attachment C

Report No. **32460P&W**

Customer: **Pratt & Whitney Middletown**

Customer Samp No. **SU6-01 - SU6-20**

Location: **Survey Unit 6**

RSA Lab Sample No. **32460**

Project: **Building 10 Decommissioning**

Date Collected: **N/A**

Samp. Description: **Wipes**

Date Counted: **8/20/2012**

Matrix: **Wipes**

RSA ID#	CUST. ID#		ALPHA CPM	ALPHA DPM	ALPHA LLD	BETA CPM	BETA DPM	BETA LLD
BACKGROUND			0.07					
32460-1	SU6-1	Survey Unit 6 Point 1	0.24	0.30	0.44			
32460-2	SU6-2	Survey Unit 6 Point 2	0.35	0.42	0.44			
32460-3	SU6-3	Survey Unit 6 Point 3	0.45	0.55	0.44			
32460-4	SU6-4	Survey Unit 6 Point 4	0.24	0.30	0.44			
32460-5	SU6-5	Survey Unit 6 Point 6	-0.02	-0.03	0.44			
32460-6	SU6-6	Survey Unit 6 Point 10	0.19	0.23	0.44			
32460-7	SU6-7	Survey Unit 6 Point 11	0.08	0.10	0.44			
32460-8	SU6-8	Survey Unit 6 Point 12	0.30	0.36	0.44			
32460-9	SU6-9	Survey Unit 6 Point 13	0.14	0.17	0.44			
32460-10	SU6-10	Survey Unit 6 Point 15	0.24	0.30	0.44			
32460-11	SU6-11	Survey Unit 6 Point 16	0.14	0.17	0.44			
32460-12	SU6-12	Survey Unit 6 Point 17	0.30	0.36	0.44			
32460-13	SU6-13	Survey Unit 6 Point 19	0.35	0.42	0.44			
32460-14	SU6-14	Survey Unit 6 Point 20	-0.07	-0.09	0.44			
32460-15	SU6-15	Survey Unit 6 Point 21	0.14	0.17	0.44			
32460-16	SU6-16	Survey Unit 6 Point 22	0.03	0.04	0.44			
32460-17	SU6-17	Survey Unit 6 Point 23	0.14	0.08	0.44			
32460-18	SU6-18	Survey Unit 6 Point 24	0.14	0.08	0.44			
32460-19	SU6-19	Survey Unit 6 Point 25	0.08	0.05	0.44			
32460-20	SU6-20	Survey Unit 6 Point 26	0.24	0.15	0.44			

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Radiochemistry Analysis Data Sheet

Attachment C

Report No. **32461P&W**

Customer: **Pratt & Whitney Middletown**

Customer Samp No. **SU7-01 - SU7-16**

Location: **Survey Unit 7**

RSA Lab Sample No. **32461**

Project: **Building 10 Decommissioning**

Date Collected: **N/A**

Samp. Description: **Wipes**

Date Counted: **8/20/2012**

Matrix: **Wipes**

RSA ID#	CUST. ID#		ALPHA CPM	ALPHA DPM	ALPHA LLD	BETA CPM	BETA DPM	BETA LLD
BACKGROUND			0.07					
32461-1	SU7-1	Survey Unit 7 Point 1	0.03	0.04	0.44			
32461-2	SU7-2	Survey Unit 7 Point 2	0.35	0.42	0.44			
32461-3	SU7-3	Survey Unit 7 Point 3	0.14	0.17	0.44			
32461-4	SU7-4	Survey Unit 7 Point 4	0.24	0.30	0.44			
32461-5	SU7-5	Survey Unit 7 Point 5	0.14	0.17	0.44			
32461-6	SU7-6	Survey Unit 7 Point 6	0.24	0.30	0.44			
32461-7	SU7-7	Survey Unit 7 Point 7	0.24	0.30	0.44			
32461-8	SU7-8	Survey Unit 7 Point 8	0.19	0.23	0.44			
32461-9	SU7-9	Survey Unit 7 Point 9	-0.02	-0.03	0.44			
32461-10	SU7-10	Survey Unit 7 Point 10	0.19	0.23	0.44			
32461-11	SU7-11	Survey Unit 7 Point 11	0.08	0.10	0.44			
32461-12	SU7-12	Survey Unit 7 Point 12	0.03	0.04	0.44			
32461-13	SU7-13	Survey Unit 7 Point 13	0.19	0.23	0.44			
32461-14	SU7-14	Survey Unit 7 Point 14	0.19	0.23	0.44			
32461-15	SU7-15	Survey Unit 7 Point 15	0.14	0.17	0.44			
32461-16	SU7-16	Survey Unit 7 Point 16	0.30	0.36	0.44			

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Radiochemistry Analysis Data Sheet

Attachment C

Report No. **32462P&W**

Customer: **Pratt & Whitney Middletown**

Customer Samp No. **SU8-01 - SU8-23**

Location: **Survey Unit 8**

RSA Lab Sample No. **32462**

Project: **Building 10 Decommissioning**

Date Collected: **N/A**

Samp. Description: **Wipes**

Date Counted: **8/21/2012**

Matrix: **Wipes**

RSA ID#	CUST. ID#		ALPHA CPM	ALPHA DPM	ALPHA LLD	BETA CPM	BETA DPM	BETA LLD
BACKGROUND			0.07					
32462-1	SU8-1	Survey Unit 8 Point 1	-0.02	-0.03	0.44			
32462-2	SU8-2	Survey Unit 8 Point 2	-0.07	-0.09	0.44			
32462-3	SU8-3	Survey Unit 8 Point 3	0.30	0.36	0.44			
32462-4	SU8-4	Survey Unit 8 Point 4	0.08	0.10	0.44			
32462-5	SU8-5	Survey Unit 8 Point 5	0.14	0.17	0.44			
32462-6	SU8-6	Survey Unit 8 Point 7	-0.02	-0.03	0.44			
32462-7	SU8-7	Survey Unit 8 Point 8	0.24	0.30	0.44			
32462-8	SU8-8	Survey Unit 8 Point 9	0.30	0.36	0.44			
32462-9	SU8-9	Survey Unit 8 Point 10	-0.07	-0.09	0.44			
32462-10	SU8-10	Survey Unit 8 Point 11	0.19	0.23	0.44			
32462-11	SU8-11	Survey Unit 8 Point 13	0.08	0.10	0.44			
32462-12	SU8-12	Survey Unit 8 Point 14	0.08	0.10	0.44			
32462-13	SU8-13	Survey Unit 8 Point 15	0.35	0.42	0.44			
32462-14	SU8-14	Survey Unit 8 Point 16	-0.02	-0.03	0.44			
32462-15	SU8-15	Survey Unit 8 Point 17	0.40	0.49	0.44			
32462-16	SU8-16	Survey Unit 8 Point 18	0.40	0.49	0.44			
32462-17	SU8-17	Survey Unit 8 Point 19	-0.07	-0.09	0.44			
32462-18	SU8-18	Survey Unit 8 Point 20	-0.07	-0.09	0.44			
32462-19	SU8-19	Survey Unit 8 Point 21	0.19	0.23	0.44			
32462-20	SU8-20	Survey Unit 8 Point 22	0.08	0.10	0.44			
32462-21	SU8-21	Survey Unit 8 Point 23	0.19	0.23	0.44			
32462-22	SU8-22	Survey Unit 8 Point 24	0.24	0.30	0.44			
32462-23	SU8-23	Survey Unit 8 Point 25	0.14	0.17	0.44			

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P&W Bldg. 10
Middletown, CT

RSA Laboratories Inc.

Radiochemistry Analysis Data Sheet

Attachment C

Report No. **32463P&W**

Customer: **Pratt & Whitney Middletown**

Customer Samp No. **SU9-01 - SU9-25**

Location: **Survey Unit 9**

RSA Lab Sample No. **32463**

Project: **Building 10 Decommissioning**

Date Collected: **N/A**

Samp. Description: **Wipes**

Date Counted: **8/22/2012**

Matrix: **Wipes**

RSA ID#	CUST. ID#		ALPHA CPM	ALPHA DPM	ALPHA LLD	BETA CPM	BETA DPM	BETA LLD
BACKGROUND			0.07					
32463-1	SU9-1	Survey Unit 9 Point 4	-0.02	-0.03	0.44			
32463-2	SU9-2	Survey Unit 9 Point 5	0.03	0.04	0.44			
32463-3	SU9-3	Survey Unit 9 Point 6	0.03	0.04	0.44			
32463-4	SU9-4	Survey Unit 9 Point 7	0.08	0.10	0.44			
32463-5	SU9-5	Survey Unit 9 Point 11	0.30	0.36	0.44			
32463-6	SU9-6	Survey Unit 9 Point 12	0.08	0.10	0.44			
32463-7	SU9-7	Survey Unit 9 Point 13	0.14	0.17	0.44			
32463-8	SU9-8	Survey Unit 9 Point 14	0.03	0.04	0.44			
32463-9	SU9-9	Survey Unit 9 Point 15	0.08	0.10	0.44			
32463-10	SU9-10	Survey Unit 9 Point 16	0.08	0.10	0.44			
32463-11	SU9-11	Survey Unit 9 Point 17	0.08	0.10	0.44			
32463-12	SU9-12	Survey Unit 9 Point 18	0.24	0.30	0.44			
32463-13	SU9-13	Survey Unit 9 Point 19	0.14	0.17	0.44			
32463-14	SU9-14	Survey Unit 9 Point 20	0.51	0.62	0.44			
32463-15	SU9-15	Survey Unit 9 Point 21	0.14	0.17	0.44			
32463-16	SU9-16	Survey Unit 9 Point 22	0.14	0.17	0.44			
32463-17	SU9-17	Survey Unit 9 Point 23	0.08	0.10	0.44			
32463-18	SU9-18	Survey Unit 9 Point 24	0.24	0.30	0.44			
32463-19	SU9-19	Survey Unit 9 Point 25	0.03	0.04	0.44			
32463-20	SU9-20	Survey Unit 9 Point 26	-0.02	-0.03	0.44			
32463-21	SU9-21	Survey Unit 9 Point 27	0.30	0.36	0.44			
32463-22	SU9-22	Survey Unit 9 Point 28	0.30	0.36	0.44			
32463-23	SU9-23	Survey Unit 9 Point 29	-0.02	-0.03	0.44			
32463-24	SU9-24	Survey Unit 9 Point 31	0.19	0.23	0.44			
32463-25	SU9-25	Survey Unit 9 Point 32	0.40	0.49	0.44			

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P&W Bldg. 10
Middletown. CT

RSA Laboratories Inc.
Radiochemistry Analysis Data Sheet

Attachment C

Report No. **32464P&W**

Customer: **Pratt & Whitney Middletown**

Customer Samp No. **SU10-01 - SU10-22**

Location: **Survey Unit 10**

RSA Lab Sample No. **32464**

Project: **Building 10 Decommissioning**

Date Collected: **N/A**

Samp. Description: **Wipes**

Date Counted: **8/27/2012**

Matrix: **Wipes**

RSA ID#	CUST. ID#		ALPHA CPM	ALPHA DPM	ALPHA LLD	BETA CPM	BETA DPM	BETA LLD
SU10-1			0.07					
SU10-1	SU10-1	Survey Unit 10 Point 1	0.30	0.36	0.44			
SU10-2	SU10-2	Survey Unit 10 Point 2	0.30	0.36	0.44			
SU10-3	SU10-3	Survey Unit 10 Point 3	0.40	0.49	0.44			
SU10-4	SU10-4	Survey Unit 10 Point 4	0.19	0.23	0.44			
SU10-5	SU10-5	Survey Unit 10 Point 5	0.24	0.30	0.44			
SU10-6	SU10-6	Survey Unit 10 Point 6	0.24	0.30	0.44			
SU10-7	SU10-7	Survey Unit 10 Point 7	0.24	0.30	0.44			
SU10-8	SU10-8	Survey Unit 10 Point 8	0.61	0.75	0.44			
SU10-9	SU10-9	Survey Unit 10 Point 9	0.24	0.30	0.44			
SU10-10	SU10-10	Survey Unit 10 Point 10	0.30	0.36	0.44			
SU10-11	SU10-11	Survey Unit 10 Point 11	-0.02	-0.03	0.44			
SU10-12	SU10-12	Survey Unit 10 Point 12	0.35	0.42	0.44			
SU10-13	SU10-13	Survey Unit 10 Point 13	0.08	0.10	0.44			
SU10-14	SU10-14	Survey Unit 10 Point 14	0.08	0.10	0.44			
SU10-15	SU10-15	Survey Unit 10 Point 15	0.72	0.87	0.44			
SU10-16	SU10-16	Survey Unit 10 Point 16	0.08	0.10	0.44			
SU10-17	SU10-17	Survey Unit 10 Point 17	0.24	0.15	0.44			
SU10-18	SU10-18	Survey Unit 10 Point 18	-0.02	-0.01	0.44			
SU10-19	SU10-19	Survey Unit 10 Point 19	0.03	0.02	0.44			
SU10-20	SU10-20	Survey Unit 10 Point 20	0.40	0.25	0.44			
SU10-21	SU10-21	Survey Unit 10 Point 21	0.19	0.12	0.44			
SU10-22	SU10-22	Survey Unit 10 Point 22	0.30	0.18	0.44			

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Attachment D

Final Status Direct Survey Results–

Survey Units 1 through 10

Survey Unit 1

Measurement #	Surface type	Gross alpha (180 min)	Gross alpha cpm	Alpha dpm/100 cm^2
SU-1-1	concrete	1480	8.22	1.01
SU-1-2	concrete	5018	71.69	0.94
SU-1-3	concrete	5325	76.07	5.14*
SU-1-4	concrete	1973	32.88	-1.14
SU-1-7	concrete	1346	7.48	-2.37
SU-1-8	concrete	1401	7.78	-0.99
SU-1-9	concrete	1805	30.08	-3.78
SU-1-10	concrete	4871	69.59	-1.07
SU-1-11	concrete	4045	57.79	25.82*
SU-1-12	concrete	2288	38.13	3.79
SU-1-13	concrete	1453	8.07	0.33
SU-1-14	concrete	5880	84.00	12.72*
SU-1-15	concrete	4880	69.71	37.91*
SU-1-16	concrete	3859	55.13	23.13*
SU-1-19	concrete	1269	7.05	-4.32
SU-1-20	concrete	2595	14.42	12.94*
SU-1-21	concrete	2170	12.06	2.47
SU-1-22	concrete	1919	10.66	-3.72
SU-1-23	concrete	1737	9.65	-8.21
SU-1-24	concrete	5210	74.43	3.57

* = Exceeds DCGL

Survey Unit 2

Measurement #	Surface type	Gross alpha (180 min)	Gross alpha cpm	Alpha dpm/100 cm^2
SU-2-1	concrete	2964	42.34	10.18*
SU-2-1 Recount	"			-26.50
SU-2-2	concrete	3660	52.29	20.25*
SU-2-2 Recount				-8.73
SU-2-3	concrete	4771	68.16	36.33*
SU-2-3 Recount				-2.46
SU-2-4	concrete	3458	49.40	17.33*
SU-2-4 Recount	"			-7.27
SU-2-5	concrete	4906	70.09	7.73*
SU-2-5 Recount				-11.36
SU-2-6	concrete	3713	53.04	-8.57
SU-2-7	concrete	4576	65.37	33.51*
SU-2-7 Recount	"			5.01
SU-2-8	concrete	2910	41.57	-19.54
SU-2-9	concrete	5626	80.37	9.25*
SU-2-9 Recount	"			5.20
SU-2-10	concrete	3505	50.07	-19.73
SU-2-12	concrete	4215	60.21	-10.03
SU-2-13	concrete	4162	59.46	-10.76
SU-2-14	concrete	5200	74.29	3.43
SU-2-14 Recount				0.07
SU-2-15	concrete	5466	78.09	7.07*
SU-2-16	concrete	4486	64.09	-6.33
SU-2-17	concrete	1939	27.70	-4.66
SU-2-18	concrete	1919	27.41	-4.95
SU-2-18 Recount	"			-22.26
SU-2-19	concrete	3563	50.90	18.85*
SU-2-20	concrete	1515	25.25	-8.33
SU-2-21	concrete	1484	24.73	-8.81
SU-2-22	concrete	1229	20.48	-12.81
SU-2-24	concrete	1659	27.65	-6.07

* = Exceeds DCGL

Survey Unit 3

Measurement #	Surface type	Gross alpha (180 min)	Gross alpha cpm	Alpha dpm/100 cm^2
SU-3-1	concrete	2560	36.57	4.33
SU-3-2	concrete	3364	48.06	-21.66
SU-3-3	concrete	2156	30.80	-1.52
SU-3-4	concrete	4429	63.27	1.22
SU-3-5	concrete	3526	50.37	18.31*
SU-3-6	concrete	2062	29.46	-2.88
SU-3-7	concrete	3531	50.44	-19.38
SU-3-8	concrete	5178	73.97	3.13
SU-3-9	concrete	3173	45.33	-24.27
SU-3-10	concrete	1882	31.37	-2.57
SU-3-11	concrete	3790	54.14	-7.52
SU-3-12	concrete	2771	39.59	-21.44
SU-3-13	concrete	2546	36.37	4.13
SU-3-14	concrete	4573	65.33	-5.14
SU-3-15	concrete	4362	62.31	13.35*
SU-3-16	concrete	4410	63.00	-7.37
SU-3-17	concrete	3433	49.04	16.96*
SU-3-18	concrete	5036	71.94	1.19

* = Exceeds DCGL

Survey Unit 4 – Background Area

Measurement #	Surface type	Gross alpha (180 min)	Gross alpha cpm	Alpha dpm/100 cm^2
SU-4-1	concrete	3874	55.34	6.12*
SU-4-2	concrete	3078	43.97	-5.69
SU-4-3	concrete	3939	56.27	7.08*
SU-4-4	concrete	2650	37.86	-12.03
SU-4-5	concrete	2913	41.61	-8.13
SU-4-6	concrete	3551	50.73	1.33
SU-4-7	concrete	3818	54.54	5.29*
SU-4-8	concrete	3265	46.64	-23.01
SU-4-12	concrete	2877	41.10	-19.99
SU-4-13	concrete	2118	30.26	-2.07
SU-4-14	concrete	2200	31.43	-0.88
SU-4-15	concrete	1507	21.53	-10.91
SU-4-17	partial dirt-under tiles	1914	27.34	-41.48
SU-4-18	partial dirt-under tiles	838	11.97	-56.18
SU-4-20	concrete	1484	21.20	-11.25
SU-4-21	partial dirt-beneath tiles	1651	23.59	-36.75
SU-4-22	concrete	1045	14.93	-45.03
SU-4-23	concrete	1250	17.86	-14.63
SU-4-24	concrete	1444	20.63	-11.83

* = Exceeds DCGL

Survey Unit 5

Measurement #	Surface type	Gross alpha (180 min)	Gross alpha cpm	Alpha dpm/100 cm^2
SU-5-1	concrete	3401	48.59	-21.15
SU-5-2	concrete	2501	35.73	-33.45
SU-5-3	concrete	3504	50.06	0.63
SU-5-4	concrete	4348	62.11	0.11
SU-5-5	concrete	2377	33.96	-26.83
SU-5-6	concrete	2903	41.47	9.29*
SU-5-7	concrete	1590	22.71	-37.58
SU-5-8	concrete	3027	43.24	-26.27
SU-5-9	concrete	2749	39.27	-10.56
SU-5-10	concrete	5190	74.14	11.62*
SU-5-11	concrete	3182	45.46	-24.15
SU-5-12	concrete	1693	24.19	-8.22
SU-5-13	concrete	1755	25.07	-7.32
SU-5-13	concrete	3389	48.41	-13.00
SU-5-14	concrete	1589	22.70	-9.73
SU-5-14	concrete	4519	64.56	-5.88
SU-5-15	concrete	1995	28.50	-3.85
SU-5-16	concrete	2655	37.93	5.70*
SU-5-17	concrete	4146	59.23	-10.97
SU-5-18	concrete	1692	24.17	-8.24

* = Exceeds DCGL

Survey Unit 6

Measurement #	Surface type	Gross alpha (180 min)	Gross alpha cpm	Alpha dpm/100 cm^2
SU-6-1	concrete	6440	92.00	28.70*
SU-6-1 Recount				-0.08
SU-6-2	concrete	3453	49.33	17.25*
SU-6-2 Recount				-5.92
SU-6-3	concrete	4755	67.93	19.18*
SU-6-3 Recount				-10.15
SU-6-4	concrete	3909	55.84	6.63*
SU-6-4 Recount				-0.27
SU-6-6	concrete	1725	24.64	-25.74
SU-6-10	concrete	4480	64.00	15.10*
SU-6-10 Recount	"			-0.36
SU-6-11	concrete	3670	52.43	-9.16
SU-6-12	concrete	1751	25.01	-7.38
SU-6-13	concrete	3677	52.53	3.19
SU-6-15	concrete	3736	53.37	-8.25
SU-6-16	concrete	2096	29.94	-2.39
SU-6-17	concrete	2752	39.31	-10.52
SU-6-19	concrete	5623	80.33	9.21*
SU-6-19 Recount				5.72
SU-6-20	concrete	3710	53.00	-8.61
SU-6-21	concrete	2879	41.13	8.95*
SU-6-21 Recount	"			-18.27
SU-6-22	concrete	3773	53.90	4.62
SU-6-22 Recount	"			-20.91
SU-6-23	concrete	4324	61.77	-8.54
SU-6-24	concrete	3707	52.96	-8.65
SU-6-25	concrete	1563	22.33	-10.10
SU-6-26	concrete	2451	35.01	-14.98

* = Exceeds DCGL

Survey Unit 7

Measurement #	Surface type	Gross alpha (180 min)	Gross alpha cpm	Alpha dpm/100 cm^2
SU-7-1	concrete	4215	60.21	-10.03
SU-7-2	concrete	3218	45.97	-15.33
SU-7-2	concrete	3218	45.97	-15.33
SU-7-3	concrete	1805	25.79	-6.60
SU-7-4	concrete	1785	25.50	-6.89
SU-7-5	concrete	2433	34.76	2.49
SU-7-6	concrete	2693	38.47	6.25*
SU-7-7	concrete	2119	30.27	-2.06
SU-7-8	concrete	3187	45.53	-15.76
SU-7-8	concrete	3187	45.53	-15.76
SU-7-9	concrete	3669	52.41	-17.49
SU-7-10	concrete	4420	63.14	-7.23
SU-7-11	concrete	4630	66.14	-4.36
SU-7-12	concrete	3636	51.94	-17.94
SU-7-16	concrete	3341	47.73	-21.97
SU-7-13	concrete	3842	54.89	-6.81
SU-7-14	concrete	3318	47.40	-13.97
SU-7-15	concrete	4798	68.54	6.26*

* = Exceeds DCGL

Survey Unit 8

Measurement #	Surface type	Gross alpha (180 min)	Gross alpha cpm	Alpha dpm/100 cm^2
SU-8-1	concrete	3746	53.51	4.22
SU-8-2	concrete	3687	52.67	3.34
SU-8-3	concrete	4392	62.74	13.79*
SU-8-4	concrete	3731	53.30	4.00
SU-8-5	concrete	2360	33.71	-16.33
SU-8-7	concrete	1970	28.14	-4.21
SU-8-8	concrete	5784	82.63	11.41*
SU-8-9	concrete	4964	70.91	8.53*
SU-8-10	concrete	2787	39.81	-29.55
SU-8-11	concrete	3064	43.77	-17.44
SU-8-15	concrete	2494	35.63	3.37
SU-8-16	concrete	4440	63.43	-6.96
SU-8-17	concrete	3788	54.11	-15.87
SU-8-18	concrete	4269	60.99	-9.29
SU-8-19	concrete	2462	35.17	-33.99
SU-8-20	concrete	3596	51.37	19.32*
SU-8-21	concrete	2730	39.00	-22.00
SU-8-22	concrete	3105	44.36	-16.88
SU-8-23	concrete	3095	44.21	-17.01
SU-8-24	concrete	3233	46.19	-15.13
SU-8-25	concrete	1551	22.16	-10.28

* = Exceeds DCGL

Survey Unit 9

Measurement #	Surface type	Gross alpha (180 min)	Gross alpha cpm	Alpha dpm/100 cm^2
SU-9-4	concrete	2875	41.07	-28.34
SU-9-5	concrete	2868	40.97	-28.44
SU-9-6	concrete	2561	36.59	-32.63
SU-9-7	concrete	5125	73.21	2.41
SU-9-11	concrete	3250	46.43	-14.90
SU-9-12	concrete	3597	51.39	-10.15
SU-9-13	concrete	4898	69.97	7.63*
SU-9-14	concrete	3515	50.21	-11.27
SU-9-15	concrete	3250	46.43	-14.90
SU-9-16	partial paint	2014	28.77	-31.79
SU-9-17	concrete	2484	35.49	-25.36
SU-9-18	concrete	2218	31.69	-29.00
SU-9-19	concrete	3052	43.60	-17.60
SU-9-21	concrete	2746	39.23	-30.11
SU-9-22	concrete	2705	38.64	-30.67
SU-9-23	concrete	2539	36.27	-32.93
SU-9-24	concrete	5102	72.89	2.09
SU-9-25	concrete	1828	26.11	-42.65
SU-9-26	concrete	2604	37.20	4.96
SU-9-27	partial paint	977	13.96	-18.59
SU-9-28	partial paint	1112	15.89	-16.63
SU-9-29	concrete	1410	20.14	-12.32
SU-9-31	concrete	4967	70.96	22.32*
SU-9-32	concrete	3444	49.20	17.12

* = Exceeds DCGL

Survey Unit 10

Measurement #	Surface type	Gross alpha (180 min)	Gross alpha cpm	Alpha dpm/100 cm^2
SU-10-1†	concrete	6144	87.77	39.77*
SU-10-2	concrete	5290	75.57	27.11*
SU-10-3	concrete	5678	81.11	32.86*
SU-10-4	concrete	5135	73.36	24.81*
SU-10-5	concrete	4863	69.47	20.78*
SU-10-6	concrete	5061	72.30	23.71*
SU-10-7	concrete	4643	66.33	17.52*
SU-10-8†	concrete	9817	140.24	94.22*
SU-10-9†‡	concrete	2895	41.36	-8.40
SU-10-10	concrete	4076	58.23	9.11*
SU-10-11	concrete	4064	58.06	8.93*
SU-10-12	concrete	4643	66.33	17.52*
SU-10-13	concrete	2270	32.43	-17.66
SU-10-14	concrete	4288	61.26	12.25*
SU-10-15	concrete	4520	64.57	15.69*
SU-10-16	concrete	4730	67.57	18.81*
SU-10-17	concrete	4323	61.76	12.77*
SU-10-18	concrete	3466	49.51	0.07
SU-10-19	concrete	4976	71.09	22.45*
SU-10-20	concrete	4496	64.23	15.34*
SU-10-21	concrete	3075	43.93	-5.73
SU-10-22	concrete	4119	58.84	9.75*

* = Exceeds DCGL

† = Alpha spectrum surface sample location

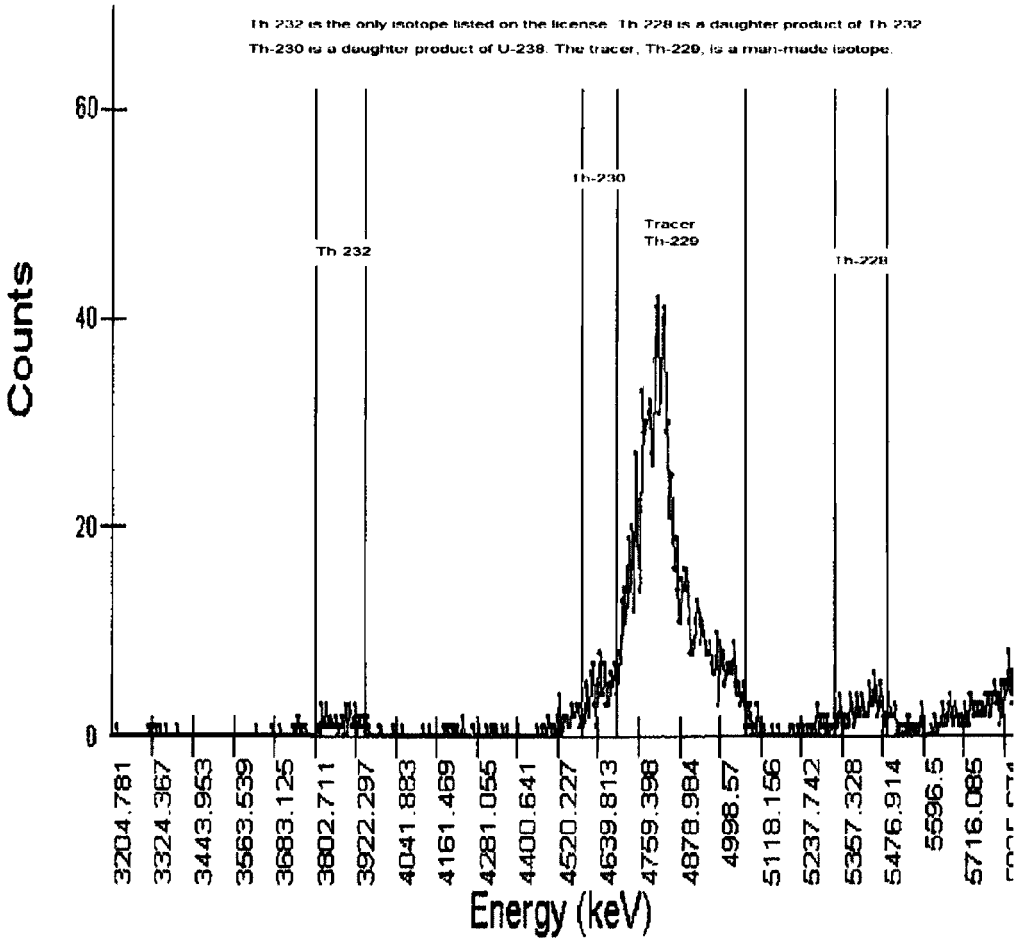
‡ = Alpha spectrum sub-surface sample location

Attachment E

Alpha Spectrum Analysis Results—

Survey Unit 10

Key to interpreting graphs contained in this attachment.



Sample ID: 32776Th **Type:** Unknown

Batch ID: Printer Batch
Acquisition Start: October 26, 2012 16:55:09
Analysis Date: November 05, 2012 13:14:30
Procedure: Thoruim Isotopic 12 Hr MDA On
Device: Oasis:01:05
Analysis Method: ROI Analysis
Spectrum File: 00001222.OXS LiveTime: 43,200.00

Calibrations:
Energy = -7.761E+01 +2.392E+00 * Chn Coeff. of Correlation: -0.999
Calibration Date: May 03, 2007 12:56:20 Std: Mixed Alpha SN: D737
Shape not Calibrated.
Efficiency = 1.213E-01 ± 4.508E-03
Calibration Date: May 04, 2007 11:05:35 Std: Pu-239 Cal Standard

Tracer Recovery: 0.893 ± 0.060
Total Efficiency: 0.108 ± 0.006

Original Sample Amount: 3.000 ± 0.000 gdry
Aliquot Amount: 1.000 ± 0.000 gdry

ROI DATA

ROI ID #	ASSOCIATED NUCLIDE	EXTENTS START	EXTENTS END	PK EN (keV)	FWHM (keV)
1 Th232	Th232	3803.3	3951.9	3824.2	3.0
2 Th230	Th230	4593.7	4693.4	4606.3	3.5
3 Th229	Th229	4694.5	5077.7	4833.5	93.9
4 Th228	Th228	5335.3	5493.9	5450.6	2.7

ROI ANALYSIS RESULTS

ROI ID	NET COUNTS	BKG/INTERF	CPM	ROI TYPE
Th232	23.0 ± 20.4	27.00	0.032 ± 0.028	Unknown
Th230	114.5 ± 17.6	13.50	0.159 ± 0.024	Unknown
Th229	2,155.0 ± 54.2	54.00	2.993 ± 0.075	Tracer
Th228	28.5 ± 37.4	94.50	0.040 ± 0.052	Unknown

NUCLIDE ANALYSIS RESULTS

ROI ID	ASSOC NUC	EMM. PROB	ACTIVITY (pCi/gdry)	MDA (pCi)
Th232	Th232	1.000	0.133 ± 0.118	3.92E-01
Th230	Th230	1.000	0.661 ± 0.108	2.81E-01
Th229	Th229	1.000	12.445 ± 0.621	5.47E-01
Th228	Th228	1.000	0.165 ± 0.216	7.19E-01

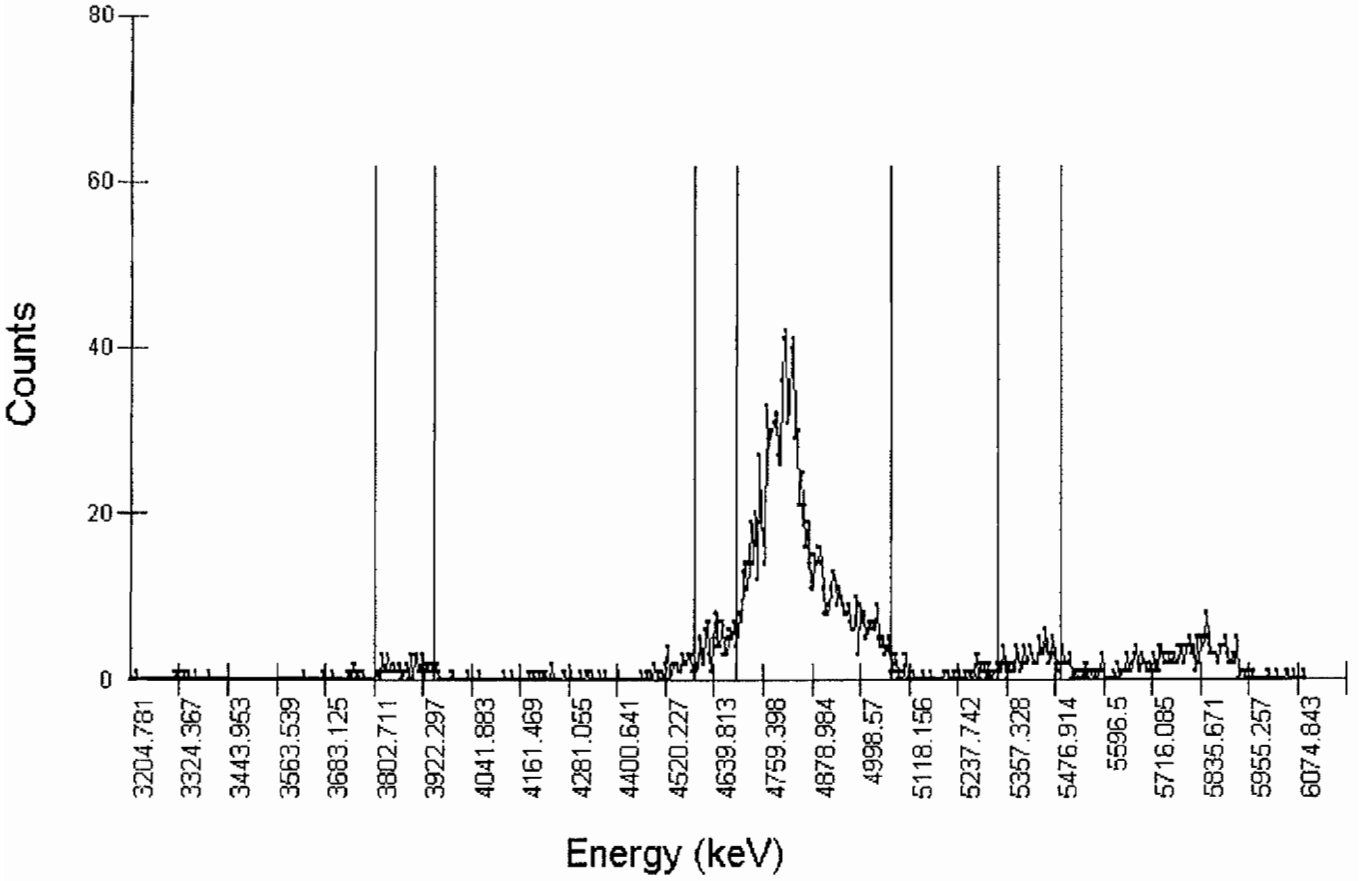
Activity reported as of October 26, 2012 16:55:09

ANALYSIS REVIEWED BY: _____

APPROVED BY: _____

Sample ID: 32776Th
Live Time: 43200.0

File: 00001222.0XS
Analysis Date: 11/5/2012 1:14:30 PM



Sample ID: 32776D **Type:** Unknown

Batch ID: Printer Batch
Acquisition Start: November 03, 2012 14:36:56
Analysis Date: November 05, 2012 12:48:31
Procedure: Uranium Isotop 12 Hr MDA On
Device: Oasis:01:05
Analysis Method: ROI Analysis
Spectrum File: 00001224.OXS LiveTime: 43,200.00

Calibrations:
Energy = -7.761E+01 +2.392E+00 * Chn Coeff. of Correlation: -0.999
Calibration Date: May 03, 2007 12:56:20 Std: Mixed Alpha SN: D737
Shape not Calibrated.
Efficiency = 1.213E-01 ± 4.508E-03
Calibration Date: May 04, 2007 11:05:35 Std: Pu-239 Cal Standard

Tracer Recovery: 0.986 ± 0.066
Total Efficiency: 0.120 ± 0.007

Original Sample Amount: 3.000 ± 0.000 gdry
Aliquot Amount: 0.638 ± 0.000 gdry

ROI DATA

ROI ID #	ASSOCIATED NUCLIDE	EXTENTS START	EXTENTS END	PK EN (keV)	FWHM (keV)
1 U238	U238	3958.6	4214.5	4083.0	3.8
2 U235	U235	4258.0	4463.4	4360.4	2.4
3 U234	U234	4502.6	4790.5	4683.3	3.8
4 U232	U232	5137.3	5367.9	5286.0	99.7

ROI ANALYSIS RESULTS

ROI ID	NET COUNTS	BKG/INTERF	CPM	ROI TYPE
U238	63.0 ± 21.3	27.00	0.088 ± 0.030	Unknown
U235	-20.0 ± 19.3	27.00	-2.78E-02 ± 0.027	Unknown
U234	88.0 ± 21.9	27.00	0.122 ± 0.030	Unknown
U232	1,905.5 ± 49.9	40.50	2.647 ± 0.069	Tracer

NUCLIDE ANALYSIS RESULTS

ROI ID	ASSOC NUC	EMM. PROB	ACTIVITY (pCi/gdry)	MDA (pCi)
U238	U238	1.000	0.517 ± 0.177	3.55E-01
U235	U235	1.000	-1.64E-01 ± 0.158	3.55E-01
U234	U234	1.000	0.722 ± 0.184	3.55E-01
U232	U232	1.000	15.625 ± 0.776	4.31E-01

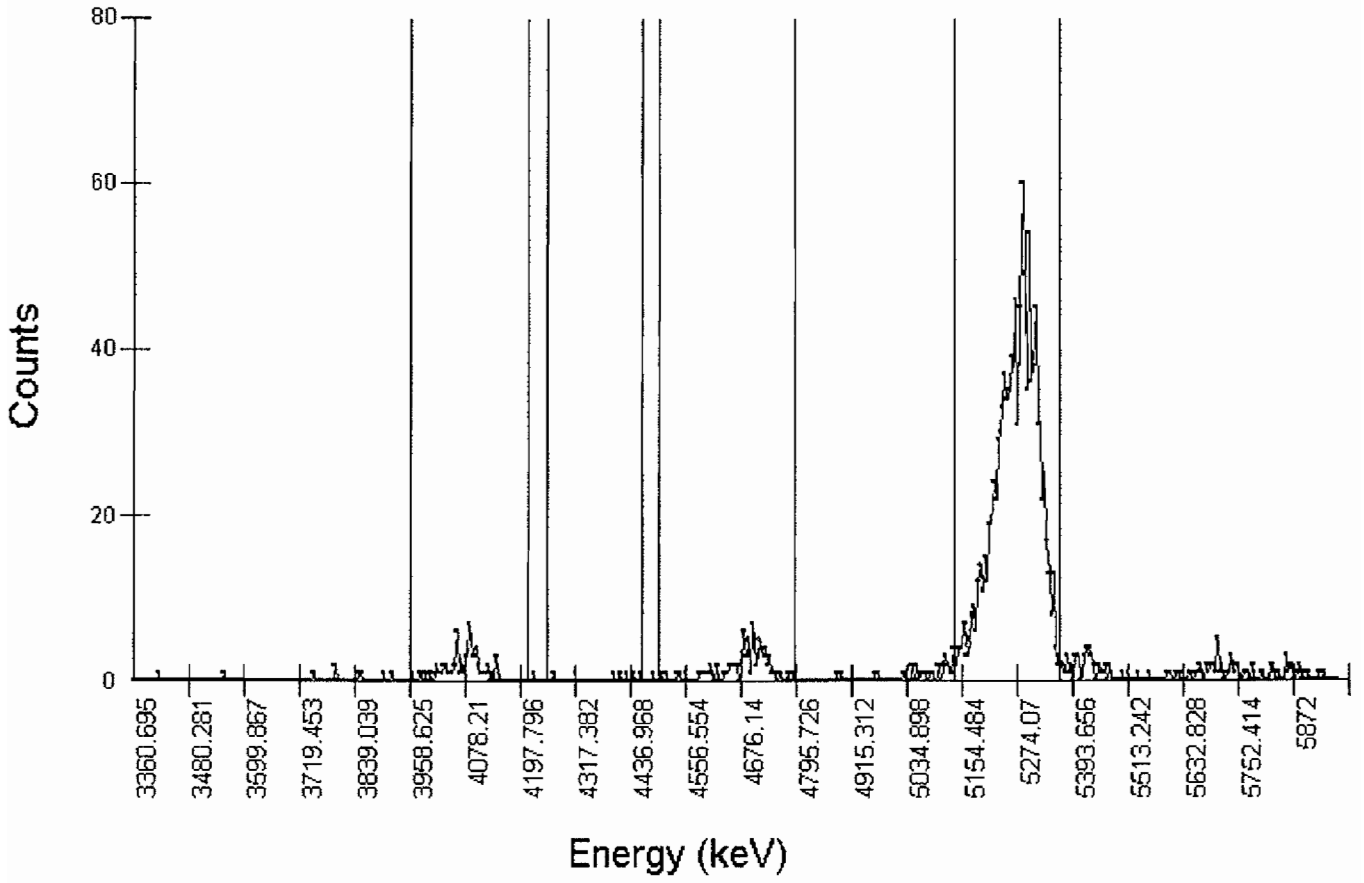
Activity reported as of November 03, 2012 14:36:56

ANALYSIS REVIEWED BY: 

APPROVED BY: _____

Sample ID: 32776D
Live Time: 43200.0

File: 00001224.0XS
Analysis Date: 11/5/2012 12:48:31 PM



Sample ID: **32777Th** **Type:** **Unknown**

Batch ID: Printer Batch
Acquisition Start: October 19, 2012 11:43:44
Analysis Date: November 05, 2012 13:22:59
Procedure: Thoruim Isotopic 12 Hr MDA On
Device: Oasis:01:05
Analysis Method: ROI Analysis
Spectrum File: 00001219.OXS LiveTime: 43,200.00

Calibrations:
Energy = -7.761E+01 +2.392E+00 * Chn Coeff. of Correlation: -0.999
Calibration Date: May 03, 2007 12:56:20 Std: Mixed Alpha SN: D737
Shape not Calibrated.
Efficiency = 1.213E-01 ± 4.508E-03
Calibration Date: May 04, 2007 11:05:35 Std: Pu-239 Cal Standard

Tracer Recovery: 0.954 ± 0.064
Total Efficiency: 0.116 ± 0.006

Original Sample Amount: 3.000 ± 0.000 gdry
Aliquot Amount: 1.004 ± 0.000 gdry

ROI DATA

ROI ID #	ASSOCIATED NUCLIDE	EXTENTS START	EXTENTS END	PK EN (keV)	FWHM (keV)
1 Th232	Th232	3836.6	3963.7	3889.0	2.4
2 Th230	Th230	4593.7	4693.4	4623.2	2.5
3 Th229	Th229	4677.7	5104.0	4812.2	103.6
4 Th228	Th228	5369.2	5537.4	5441.2	2.4

ROI ANALYSIS RESULTS

ROI ID	NET COUNTS	BKG/INTERF	CPM	ROI TYPE
Th232	24.5 ± 14.8	13.50	0.034 ± 0.021	Unknown
Th230	117.5 ± 17.7	13.50	0.163 ± 0.025	Unknown
Th229	2,301.0 ± 55.5	54.00	3.196 ± 0.077	Tracer
Th228	-28.5 ± 41.6	121.50	-3.96E-02 ± 0.058	Unknown

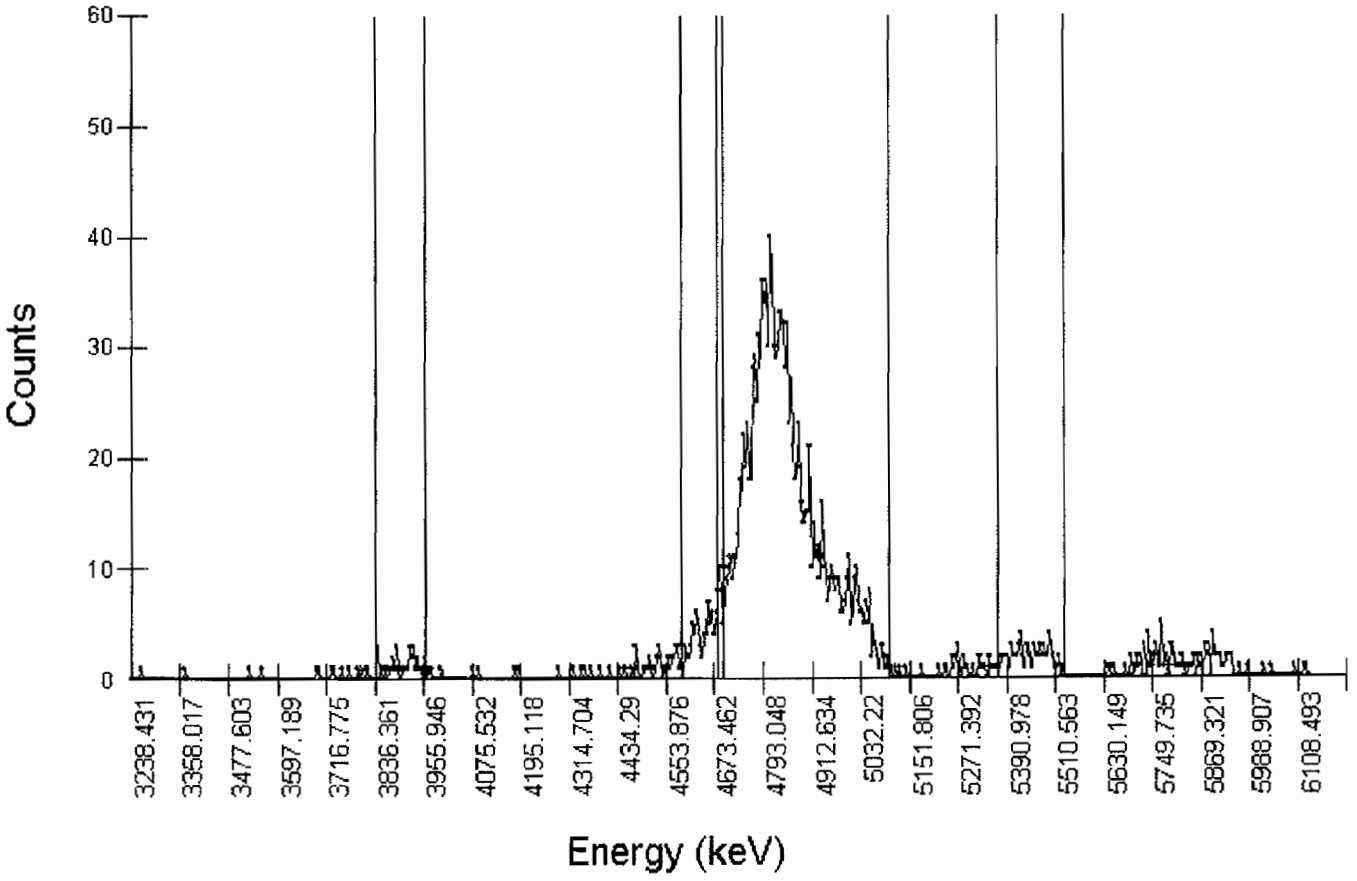
NUCLIDE ANALYSIS RESULTS

ROI ID	ASSOC NUC	EMM. PROB	ACTIVITY (pCi/gdry)	MDA (pCi)
Th232	Th232	1.000	0.132 ± 0.080	2.64E-01
Th230	Th230	1.000	0.633 ± 0.102	2.64E-01
Th229	Th229	1.000	12.396 ± 0.619	5.13E-01
Th228	Th228	1.000	-1.54E-01 ± 0.224	7.62E-01

Activity reported as of October 19, 2012 11:43:44

ANALYSIS REVIEWED BY: _____

APPROVED BY: _____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40
30
20
10
0
3238.431
3358.017
3477.603
3597.189
3716.775
3836.361
3955.946
4075.532
4195.118
4314.704
4434.29
4553.876
4673.462
4793.048
4912.634
5032.22
5151.806
5271.392
5390.978
5510.563
5630.149
5749.735
5869.321
5988.907
6108.493
Energy (keV)

Sample ID: 32777D **Type:** Unknown

Batch ID: Printer Batch
Acquisition Start: October 23, 2012 12:24:22
Analysis Date: October 24, 2012 13:39:31
Procedure: Uranium Isotop 12 Hr MDA On
Device: Oasis:01:05
Analysis Method: ROI Analysis
Spectrum File: 00001220.OXS LiveTime: 43,200.00

Calibrations:
Energy = -7.761E+01 +2.392E+00 * Chn Coeff. of Correlation: -0.999
Calibration Date: May 03, 2007 12:56:20 Std: Mixed Alpha SN: D737
Shape not Calibrated.
Efficiency = 1.213E-01 ± 4.508E-03
Calibration Date: May 04, 2007 11:05:35 Std: Pu-239 Cal Standard

Tracer Recovery: 0.949 ± 0.064
Total Efficiency: 0.115 ± 0.007

Original Sample Amount: 3.000 ± 0.000 gdry
Aliquot Amount: 1.007 ± 0.000 gdry

ROI DATA

ROI ID #	ASSOCIATED NUCLIDE	EXTENTS START	EXTENTS END	PK EN (keV)	FWHM (keV)
1 U238	U238	3997.7	4277.5	4081.1	2.8
2 U235	U235	4268.0	4473.4	4370.5	2.4
3 U234	U234	4505.6	4793.5	4636.0	6.0
4 U232	U232	5137.3	5367.9	5281.8	92.7

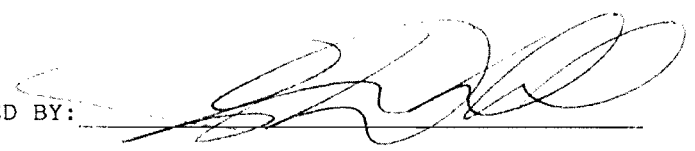
ROI ANALYSIS RESULTS

ROI ID	NET COUNTS	BKG/INTERF	CPM	ROI TYPE
U238	61.0 ± 21.3	27.00	0.085 ± 0.030	Unknown
U235	-21.0 ± 19.2	27.00	-2.92E-02 ± 0.027	Unknown
U234	72.0 ± 21.5	27.00	0.100 ± 0.030	Unknown
U232	1,835.5 ± 49.2	40.50	2.549 ± 0.068	Tracer

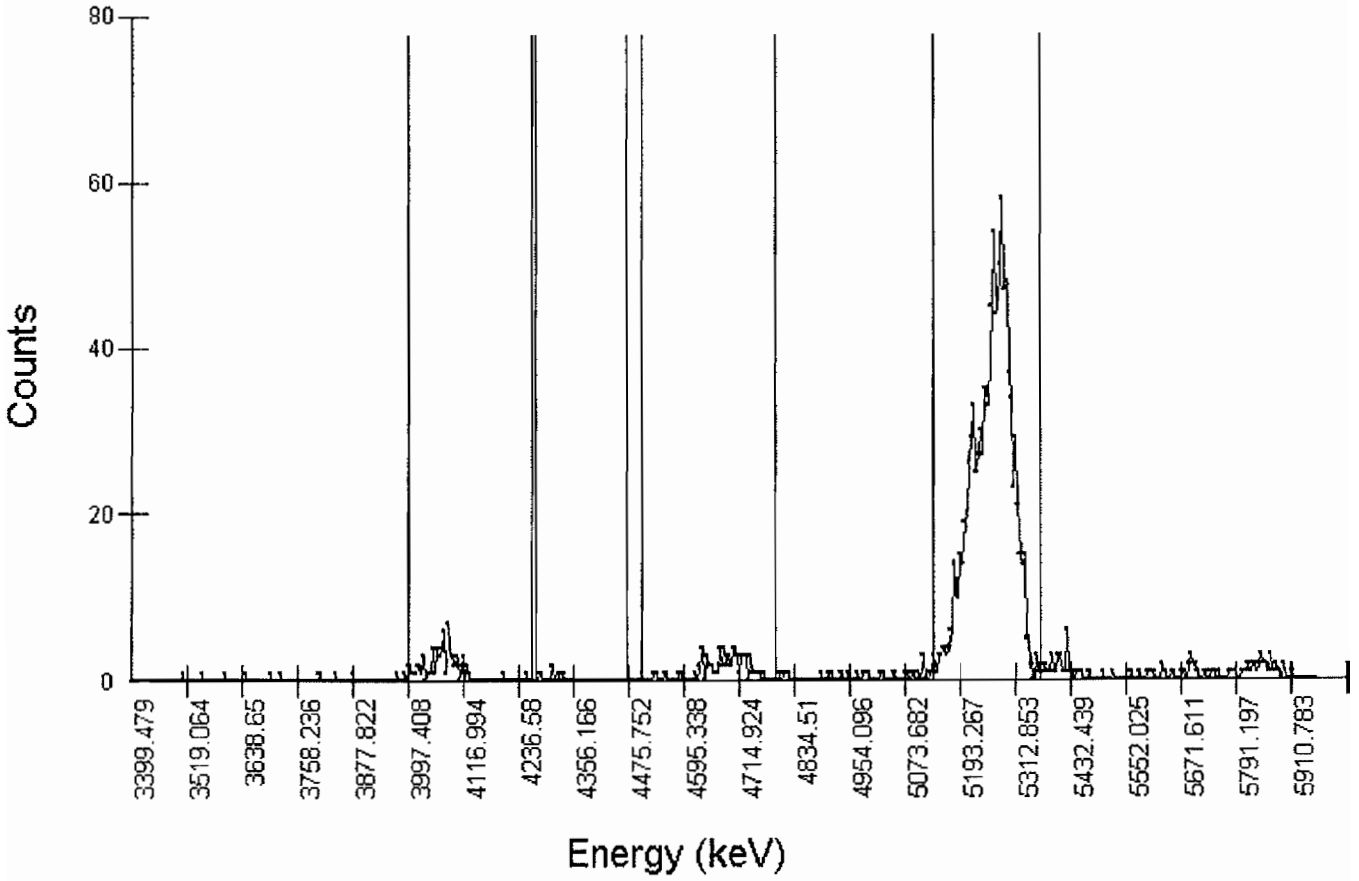
NUCLIDE ANALYSIS RESULTS

ROI ID	ASSOC NUC	EMM. PROB	ACTIVITY (pCi/gdry)	MDA (pCi)
U238	U238	1.000	0.329 ± 0.116	3.68E-01
U235	U235	1.000	-1.13E-01 ± 0.104	3.68E-01
U234	U234	1.000	0.388 ± 0.118	3.68E-01
U232	U232	1.000	9.902 ± 0.492	4.48E-01

Activity reported as of October 23, 2012 12:24:22

ANALYSIS REVIEWED BY: 

APPROVED BY: _____


Counts
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3519.064
3638.65
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3877.822
3997.408
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4236.58
4356.166
4475.752
4595.338
4714.924
4834.51
4954.096
5073.682
5193.267
5312.853
5432.439
5552.025
5671.611
5791.197
5910.783
Energy (keV)

Sample ID: **32778Th** **Type:** **Unknown**

Batch ID: Printer Batch
Acquisition Start: November 01, 2012 17:32:28
Analysis Date: November 05, 2012 12:47:15
Procedure: Thoruim Isotopic 12 Hr MDA On
Device: Oasis:01:05
Analysis Method: ROI Analysis
Spectrum File: 00001223.OXS LiveTime: 43,200.00

Calibrations:
Energy = -7.761E+01 +2.392E+00 * Chn Coeff. of Correlation: -0.999
Calibration Date: May 03, 2007 12:56:20 Std: Mixed Alpha SN: D737
Shape not Calibrated.
Efficiency = 1.213E-01 ± 4.508E-03
Calibration Date: May 04, 2007 11:05:35 Std: Pu-239 Cal Standard

Tracer Recovery: 0.944 ± 0.063
Total Efficiency: 0.115 ± 0.006

Original Sample Amount: 3.000 ± 0.000 gdry
Aliquot Amount: 1.003 ± 0.000 gdry

ROI DATA

ROI ID #	ASSOCIATED NUCLIDE	EXTENTS START	EXTENTS END	PK EN (keV)	FWHM (keV)
1 Th232	Th232	3803.1	3951.7	3865.3	2.9
2 Th230	Th230	4593.7	4693.4	4606.7	1.9
3 Th229	Th229	4694.5	5070.5	4783.7	82.3
4 Th228	Th228	5335.3	5486.7	5422.3	4.2

ROI ANALYSIS RESULTS

ROI ID	NET COUNTS	BKG/INTERF	CPM	ROI TYPE
Th232	47.0 ± 20.9	27.00	0.065 ± 0.029	Unknown
Th230	128.5 ± 18.0	13.50	0.178 ± 0.025	Unknown
Th229	2,278.0 ± 55.3	54.00	3.164 ± 0.077	Tracer
Th228	29.0 ± 34.7	81.00	0.040 ± 0.048	Unknown

NUCLIDE ANALYSIS RESULTS

ROI ID	ASSOC NUC	EMM. PROB	ACTIVITY (pCi/gdry)	MDA (pCi)
Th232	Th232	1.000	0.256 ± 0.115	3.70E-01
Th230	Th230	1.000	0.700 ± 0.105	2.66E-01
Th229	Th229	1.000	12.408 ± 0.619	5.18E-01
Th228	Th228	1.000	0.158 ± 0.189	6.31E-01

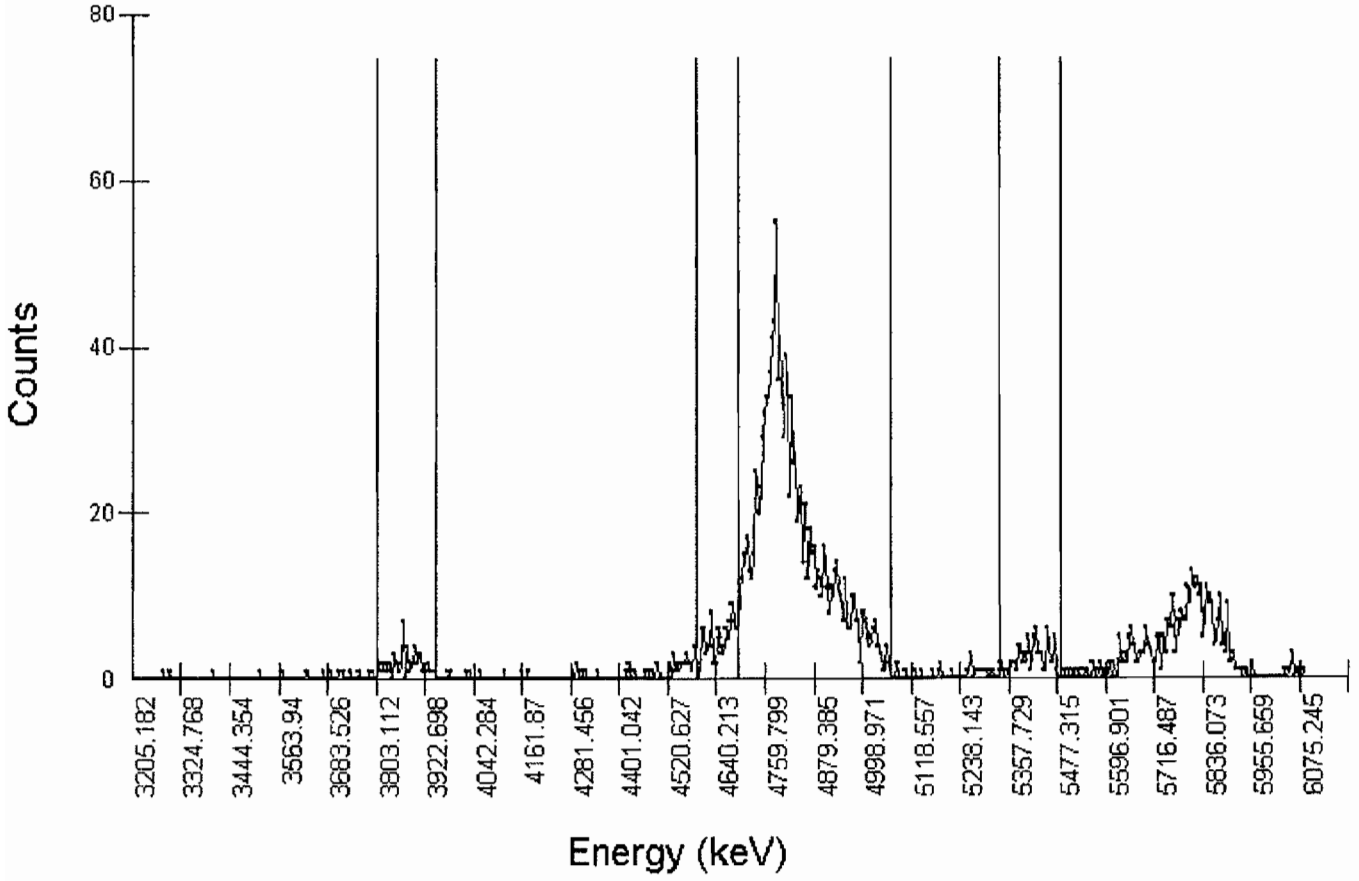
Activity reported as of November 01, 2012 17:32:28

ANALYSIS REVIEWED BY: _____

APPROVED BY: _____

Sample ID: 32778Th
Live Time: 43200.0

File: 00001223.0XS
Analysis Date: 11/5/2012 12:47:15 PM



Sample ID: 32778D **Type:** Unknown

Batch ID: Printer Batch
Acquisition Start: November 05, 2012 18:55:06
Analysis Date: November 06, 2012 16:32:02
Procedure: Uranium Isotop 12 Hr MDA On
Device: Oasis:01:05
Analysis Method: ROI Analysis
Spectrum File: 00001225.OXS LiveTime: 43,200.00

Calibrations:
Energy = -7.761E+01 +2.392E+00 * Chn Coeff. of Correlation: -0.999
Calibration Date: May 03, 2007 12:56:20 Std: Mixed Alpha SN: D737
Shape not Calibrated.
Efficiency = 1.213E-01 ± 4.508E-03
Calibration Date: May 04, 2007 11:05:35 Std: Pu-239 Cal Standard

Tracer Recovery: 0.799 ± 0.055
Total Efficiency: 0.097 ± 0.006

Original Sample Amount: 3.000 ± 0.000 gdry
Aliquot Amount: 1.001 ± 0.000 gdry

ROI DATA

ROI ID #	ASSOCIATED NUCLIDE	EXTENTS START	EXTENTS END	PK EN (keV)	FWHM (keV)
1 U238	U238	4021.6	4277.5	4134.7	6.0
2 U235	U235	4268.0	4473.4	4371.4	2.4
3 U234	U234	4505.6	4793.5	4694.3	2.8
4 U232	U232	5137.3	5367.9	5282.7	9.2

ROI ANALYSIS RESULTS

ROI ID	NET COUNTS	BKG/INTERF	CPM	ROI TYPE
U238	22.0 ± 20.3	27.00	0.031 ± 0.028	Unknown
U235	-21.0 ± 19.2	27.00	-2.92E-02 ± 0.027	Unknown
U234	24.0 ± 20.4	27.00	0.033 ± 0.028	Unknown
U232	1,543.5 ± 46.2	40.50	2.144 ± 0.064	Tracer

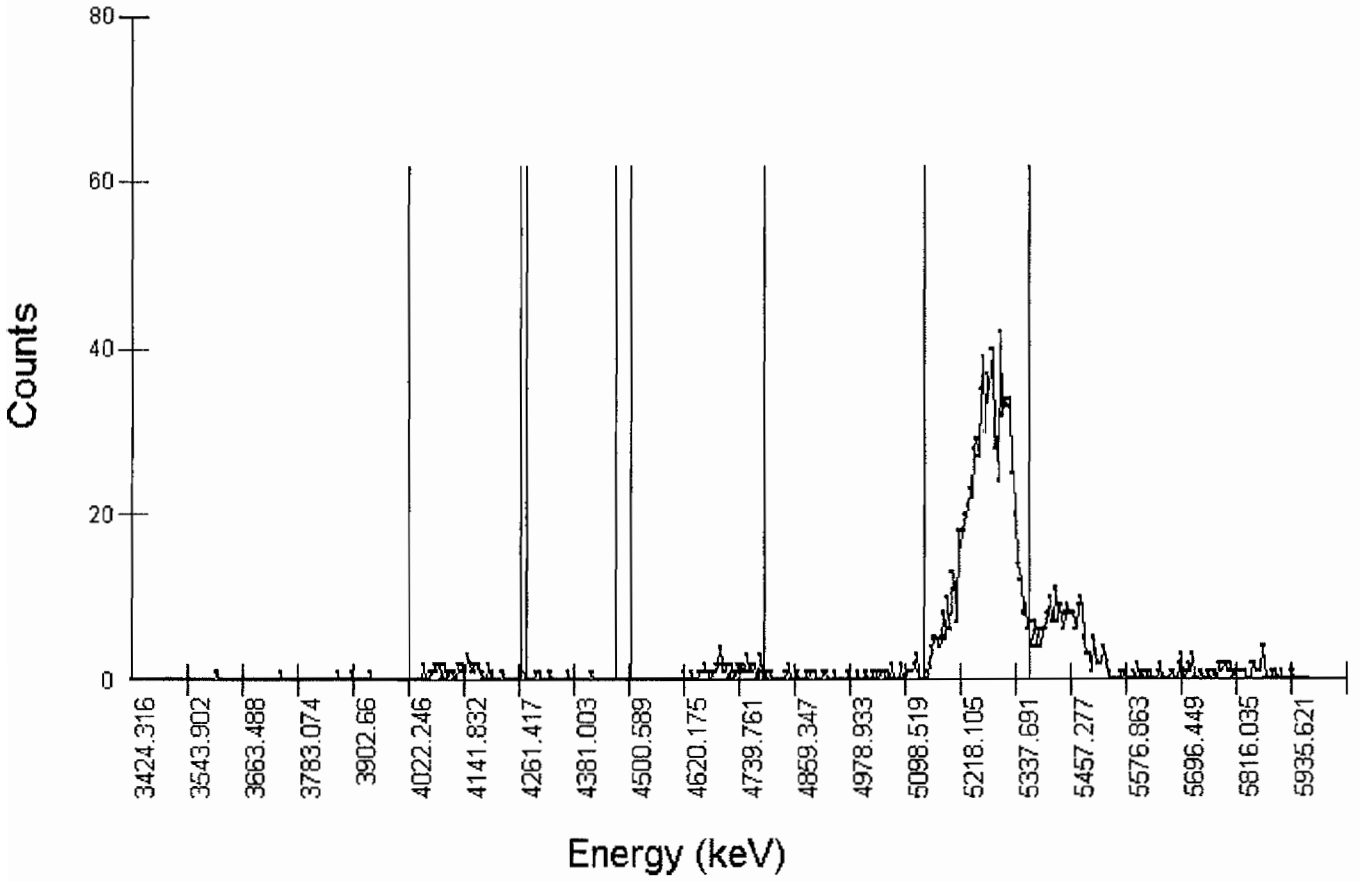
NUCLIDE ANALYSIS RESULTS

ROI ID	ASSOC NUC	EMM. PROB	ACTIVITY (pCi/gdry)	MDA (pCi)
U238	U238	1.000	0.142 ± 0.131	4.38E-01
U235	U235	1.000	-1.35E-01 ± 0.124	4.38E-01
U234	U234	1.000	0.155 ± 0.132	4.38E-01
U232	U232	1.000	9.958 ± 0.495	5.32E-01

Activity reported as of November 05, 2012 18:55:06

ANALYSIS REVIEWED BY: _____

APPROVED BY: _____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40
20
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3783.074
3902.66
4022.246
4141.832
4261.417
4381.003
4500.589
4620.175
4739.761
4859.347
4978.933
5098.519
5218.105
5337.691
5457.277
5576.863
5696.449
5816.035
5935.621
Energy (keV)

Sample ID: 32779Th **Type:** Unknown

Batch ID: Printer Batch
Acquisition Start: October 24, 2012 17:03:47
Analysis Date: November 05, 2012 14:07:19
Procedure: Thoruim Isotopic 12 Hr MDA On
Device: Oasis:01:05
Analysis Method: ROI Analysis
Spectrum File: 00001221.OXS LiveTime: 43,200.00

Calibrations:
Energy = -7.761E+01 +2.392E+00 * Chn Coeff. of Correlation: -0.999
Calibration Date: May 03, 2007 12:56:20 Std: Mixed Alpha SN: D737
Shape not Calibrated.
Efficiency = 1.213E-01 ± 4.508E-03
Calibration Date: May 04, 2007 11:05:35 Std: Pu-239 Cal Standard

Tracer Recovery: 0.897 ± 0.060
Total Efficiency: 0.109 ± 0.006

Original Sample Amount: 3.000 ± 0.000 gdry
Aliquot Amount: 1.001 ± 0.000 gdry

ROI DATA

ROI ID #	ASSOCIATED NUCLIDE	EXTENTS START	EXTENTS END	PK EN (keV)	FWHM (keV)
1 Th232	Th232	3840.8	3951.2	3872.4	3.0
2 Th230	Th230	4593.7	4693.4	4616.2	3.6
3 Th229	Th229	4694.5	5180.5	4896.1	122.0
4 Th228	Th228	5335.3	5443.7	5386.4	4.8

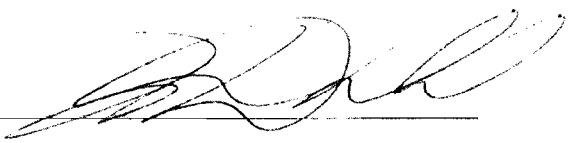
ROI ANALYSIS RESULTS

ROI ID	NET COUNTS	BKG/INTERF	CPM	ROI TYPE
Th232	18.5 ± 14.6	13.50	0.026 ± 0.020	Unknown
Th230	107.5 ± 17.4	13.50	0.149 ± 0.024	Unknown
Th229	2,165.0 ± 54.3	54.00	3.007 ± 0.075	Tracer
Th228	-48.5 ± 30.5	67.50	-6.74E-02 ± 0.042	Unknown

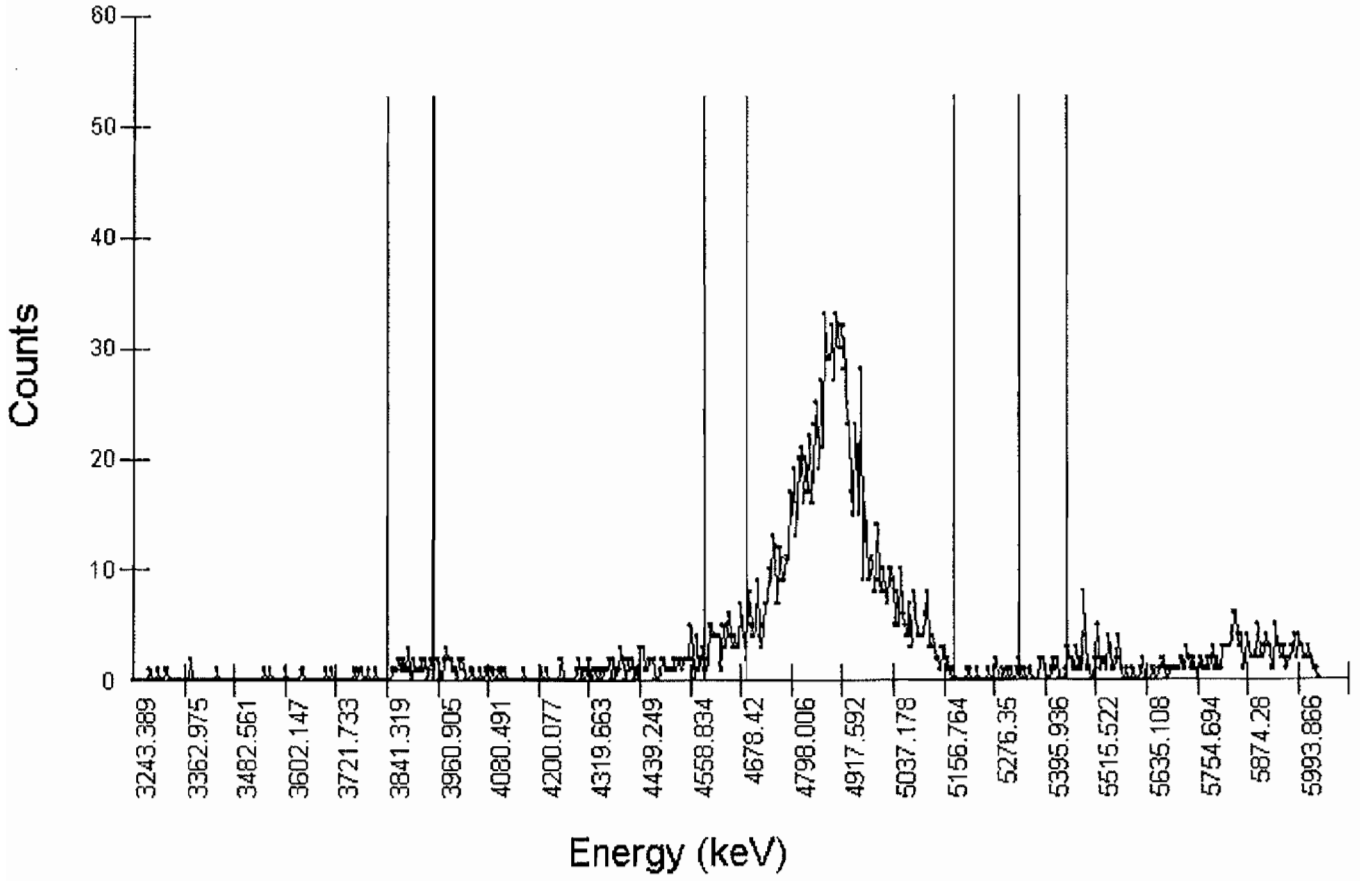
NUCLIDE ANALYSIS RESULTS

ROI ID	ASSOC NUC	EMM. PROB	ACTIVITY (pCi/gdry)	MDA (pCi)
Th232	Th232	1.000	0.106 ± 0.084	2.80E-01
Th230	Th230	1.000	0.617 ± 0.106	2.80E-01
Th229	Th229	1.000	12.433 ± 0.621	5.45E-01
Th228	Th228	1.000	-2.79E-01 ± 0.176	6.07E-01

Activity reported as of October 24, 2012 17:03:47

ANALYSIS REVIEWED BY: 

APPROVED BY: _____


Counts
60
50
40
30
20
10
0
3243.389
3362.975
3482.561
3602.147
3721.733
3841.319
3960.905
4080.491
4200.077
4319.663
4439.249
4558.834
4678.42
4798.006
4917.592
5037.178
5156.764
5276.35
5395.936
5515.522
5635.108
5754.694
5874.28
5993.866
Energy (keV)

Sample ID: 32779D **Type:** Unknown

Batch ID: Printer Batch
Acquisition Start: November 06, 2012 18:21:01
Analysis Date: November 07, 2012 11:06:16
Procedure: Uranium Isotop 12 Hr MDA On
Device: Oasis:01:05
Analysis Method: ROI Analysis
Spectrum File: 00001227.OXS LiveTime: 43,200.00

Calibrations:
Energy = -7.761E+01 +2.392E+00 * Chn Coeff. of Correlation: -0.999
Calibration Date: May 03, 2007 12:56:20 Std: Mixed Alpha SN: D737
Shape not Calibrated.
Efficiency = 1.213E-01 ± 4.508E-03
Calibration Date: May 04, 2007 11:05:35 Std: Pu-239 Cal Standard

Tracer Recovery: 0.978 ± 0.066
Total Efficiency: 0.119 ± 0.007

Original Sample Amount: 3.000 ± 0.000 gdry
Aliquot Amount: 1.001 ± 0.000 gdry

ROI DATA

ROI ID #	ASSOCIATED NUCLIDE	EXTENTS START	EXTENTS END	PK EN (keV)	FWHM (keV)
1 U238	U238	4021.6	4277.5	4078.9	5.4
2 U235	U235	4268.0	4473.4	4370.7	2.4
3 U234	U234	4505.6	4834.1	4667.3	3.0
4 U232	U232	5142.1	5413.4	5363.2	68.2

ROI ANALYSIS RESULTS

ROI ID	NET COUNTS	BKG/INTERF	CPM	ROI TYPE
U238	33.0 ± 20.6	27.00	0.046 ± 0.029	Unknown
U235	-22.0 ± 19.2	27.00	-3.06E-02 ± 0.027	Unknown
U234	37.0 ± 20.7	27.00	0.051 ± 0.029	Unknown
U232	1,890.5 ± 49.8	40.50	2.626 ± 0.069	Tracer

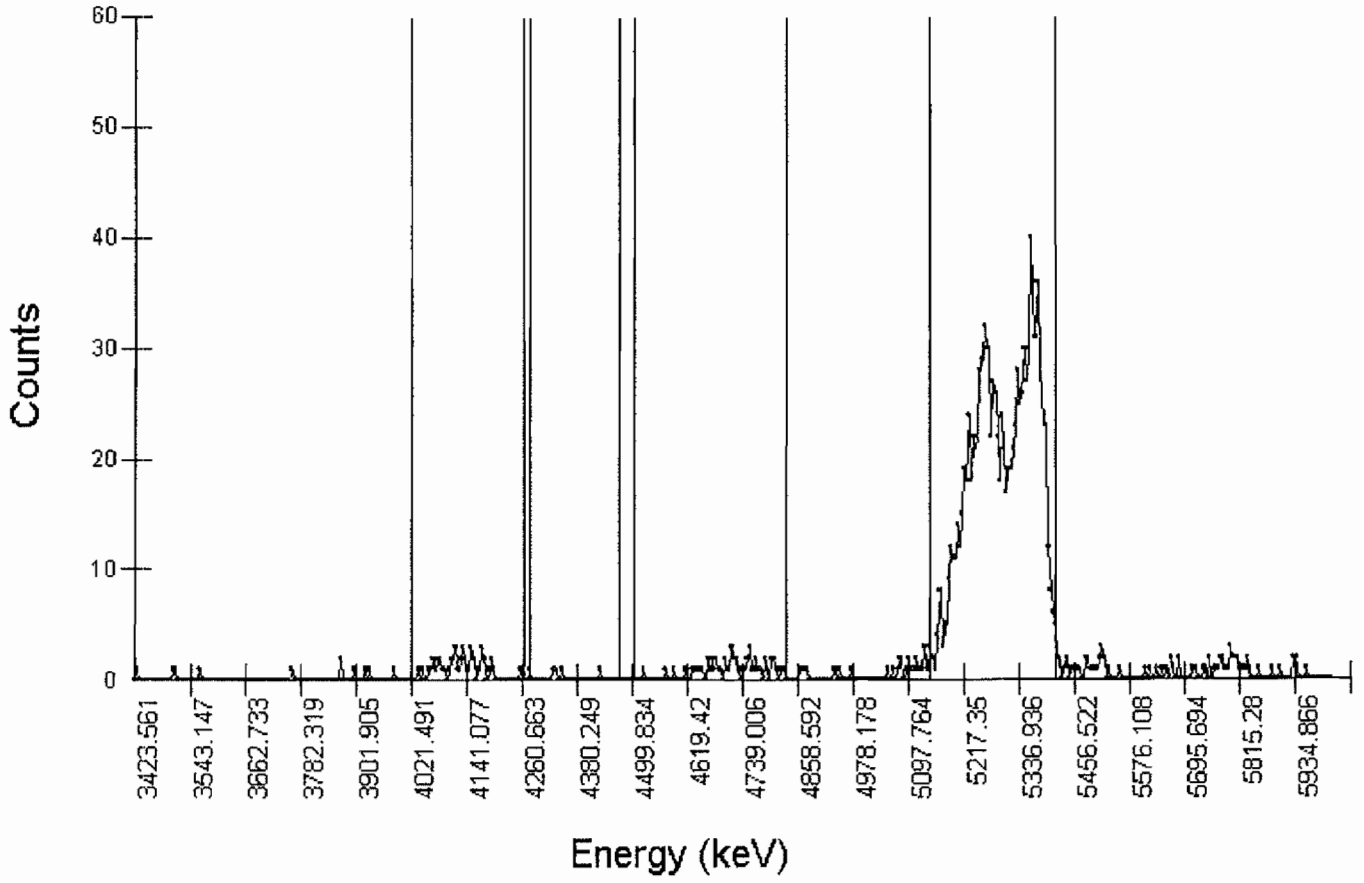
NUCLIDE ANALYSIS RESULTS

ROI ID	ASSOC NUC	EMM. PROB	ACTIVITY (pCi/gdry)	MDA (pCi)
U238	U238	1.000	0.174 ± 0.109	3.57E-01
U235	U235	1.000	-1.16E-01 ± 0.101	3.57E-01
U234	U234	1.000	0.195 ± 0.110	3.57E-01
U232	U232	1.000	9.958 ± 0.495	4.35E-01

Activity reported as of November 06, 2012 18:21:01

ANALYSIS REVIEWED BY: _____

APPROVED BY: _____


Counts
60
50
40
30
20
10
0
3423.561
3543.147
3662.733
3782.319
3901.905
4021.491
4141.077
4260.663
4380.249
4499.834
4619.42
4739.006
4858.592
4978.178
5097.764
5217.35
5336.936
5456.522
5576.108
5695.694
5815.28
5934.866
Energy (keV)

Attachment F

Wilcoxon Rank Sum (WRS) Wipe Test Results

The following pages contain data tables showing the WRS Test data for wipe tests performed in Survey Units (SU) 1 through 10 at Building 10, Pratt & Whitney, Middletown, Connecticut. SU-4 was designated as the reference (background) area. This is where the cafeteria and other areas were located with a very small likelihood of becoming contaminated.

Survey Units 6, 9 and 10 each contained one or more wipe samples that exceeded the DCGL of 0.5 dpm/100 cm^2. The WRS Test was performed on these data sets and the sum of the reference area ranks is greater than the critical value, so the null hypothesis (*i.e.*, that the average survey unit concentration exceeds the $DCGL_W$) is rejected and the units pass the test.

SURVEY UNIT 9 WIPES WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	0.17	R	0.77	37	37
2	0.10	R	0.70	34	34
3	-0.03	R	0.57	25	25
4	0.17	R	0.77	38	38
5	0.10	R	0.70	35	35
6	0.10	R	0.70	36	36
7	0.04	R	0.64	31	31
8	-0.03	R	0.57	26	26
9	0.04	R	0.64	32	32
10	0.23	R	0.83	39	39
11	0.04	R	0.64	33	33
12	0.36	R	0.96	42	42
13	-0.03	R	0.57	27	27
14	-0.03	R	0.57	28	28
15	0.23	R	0.83	40	40
16	0.36	R	0.96	43	43
17	-0.03	R	0.57	29	29
18	0.23	R	0.83	41	41
19	0.36	R	0.96	44	44
20	-0.03	SU-9	-0.03	1	0
21	0.04	SU-9	0.04	4	0
22	0.04	SU-9	0.04	5	0
23	0.10	SU-9	0.10	8	0
24	0.36	SU-9	0.36	21	0
25	0.10	SU-9	0.10	9	0
26	0.17	SU-9	0.17	14	0
27	0.04	SU-9	0.04	6	0
28	0.10	SU-9	0.10	10	0
29	0.10	SU-9	0.10	11	0
30	0.10	SU-9	0.10	12	0
31	0.30	SU-9	0.30	19	0
32	0.17	SU-9	0.17	15	0
33	0.62	SU-9	0.62	30	0
34	0.17	SU-9	0.17	16	0
35	0.17	SU-9	0.17	17	0
36	0.10	SU-9	0.10	13	0
37	0.30	SU-9	0.30	20	0
38	0.04	SU-9	0.04	7	0
39	-0.03	SU-9	-0.03	2	0
40	0.36	SU-9	0.36	22	0
41	0.36	SU-9	0.36	23	0
42	-0.03	SU-9	-0.03	3	0
43	0.23	SU-9	0.23	18	0
44	0.49	SU-9	0.49	24	0
		Sum of the Ranks-->		990	
		Sum of the Reference Area Ranks-->			**660**

m =19 *n* =25 Alpha = .05 Critical value = 499

SURVEY UNIT 6 WIPES WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	0.17	R	0.77	32	32
2	0.10	R	0.70	29	29
3	-0.03	R	0.57	21	21
4	0.17	R	0.77	33	33
5	0.10	R	0.70	30	30
6	0.10	R	0.70	31	31
7	0.04	R	0.64	26	26
8	-0.03	R	0.57	22	22
9	0.04	R	0.64	27	27
10	0.23	R	0.83	34	34
11	0.04	R	0.64	28	28
12	0.36	R	0.96	37	37
13	-0.03	R	0.57	23	23
14	-0.03	R	0.57	24	24
15	0.23	R	0.83	35	35
16	0.36	R	0.96	38	38
17	-0.03	R	0.57	25	25
18	0.23	R	0.83	36	36
19	0.36	R	0.96	39	39
20	0.30	SU-6	0.30	13	0
21	0.42	SU-6	0.42	18	0
22	0.55	SU-6	0.55	20	0
23	0.30	SU-6	0.30	14	0
24	-0.03	SU-6	-0.03	2	0
25	0.23	SU-6	0.23	12	0
26	0.10	SU-6	0.10	7	0
27	0.36	SU-6	0.36	16	0
28	0.17	SU-6	0.17	9	0
29	0.30	SU-6	0.30	15	0
30	0.17	SU-6	0.17	10	0
31	0.36	SU-6	0.36	17	0
32	0.42	SU-6	0.42	19	0
33	-0.09	SU-6	-0.09	1	0
34	0.17	SU-6	0.17	11	0
35	0.04	SU-6	0.04	3	0
36	0.08	SU-6	0.08	5	0
37	0.08	SU-6	0.08	6	0
38	0.05	SU-6	0.05	4	0
39	0.15	SU-6	0.15	8	0
		Sum of the Ranks-->		780	
		Sum of the Reference Area Ranks-->			**570**

m =19 *n* =19 Alpha = .05 Critical value = 427

SURVEY UNIT 10 WIPES WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	0.17	R	0.77	33	33
2	0.10	R	0.70	29	29
3	-0.03	R	0.57	21	21
4	0.17	R	0.77	34	34
5	0.10	R	0.70	30	30
6	0.10	R	0.70	31	31
7	0.04	R	0.64	26	26
8	-0.03	R	0.57	22	22
9	0.04	R	0.64	27	27
10	0.23	R	0.83	35	35
11	0.04	R	0.64	28	28
12	0.36	R	0.96	39	39
13	-0.03	R	0.57	23	23
14	-0.03	R	0.57	24	24
15	0.23	R	0.83	36	36
16	0.36	R	0.96	40	40
17	-0.03	R	0.57	25	25
18	0.23	R	0.83	37	37
19	0.36	R	0.96	41	41
20	0.36	SU-10	0.36	16	0
21	0.36	SU-10	0.36	17	0
22	0.49	SU-10	0.49	20	0
23	0.23	SU-10	0.23	10	0
24	0.30	SU-10	0.30	12	0
25	0.30	SU-10	0.30	13	0
26	0.30	SU-10	0.30	14	0
27	0.75	SU-10	0.75	32	0
28	0.30	SU-10	0.30	15	0
29	0.36	SU-10	0.36	18	0
30	-0.03	SU-10	-0.03	1	0
31	0.42	SU-10	0.42	19	0
32	0.10	SU-10	0.10	4	0
33	0.10	SU-10	0.10	5	0
34	0.87	SU-10	0.87	38	0
35	0.10	SU-10	0.10	6	0
36	0.15	SU-10	0.15	8	0
37	-0.01	SU-10	-0.01	2	0
38	0.02	SU-10	0.02	3	0
39	0.25	SU-10	0.25	11	0
40	0.12	SU-10	0.12	7	0
41	0.18	SU-10	0.18	9	0
		Sum of the Ranks-->		861	
		Sum of the Reference Area Ranks-->			**581**

m =19 *n* =22 Alpha = .05 Critical value = 463

Attachment G

Wilcoxon Rank Sum (WRS) Direct Measurement Results

The following pages contain data tables showing the WRS Test data for Survey Units (SU) 1 through 10 at Building 10, Pratt & Whitney, Middletown, Connecticut. SU-4 was designated as the reference (background) area. This is where the cafeteria and other areas were located with a very small likelihood of becoming contaminated.

For SU-1 through SU-9 the sum of the reference area ranks is greater than the critical value, so the null hypothesis (*i.e.*, that the average survey unit concentration exceeds the $DCGL_W$) is rejected and the units pass the test. SU-10 does not Pass the test.

SURVEY UNIT 1 DIRECTS WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	6.12	R	12.12	33	33
2	4.56	R	10.56	23.5	23.5
3	7.08	R	13.08	36	36
4	4.56	R	10.56	23.5	23.5
5	4.56	R	10.56	23.5	23.5
6	4.56	R	10.56	23.5	23.5
7	5.29	R	11.29	32	32
8	4.56	R	10.56	23.5	23.5
9	4.56	R	10.56	23.5	23.5
10	4.56	R	10.56	23.5	23.5
11	4.56	R	10.56	23.5	23.5
12	4.56	R	10.56	23.5	23.5
13	4.56	R	10.56	23.5	23.5
14	4.56	R	10.56	23.5	23.5
15	4.56	R	10.56	23.5	23.5
16	4.56	R	10.56	23.5	23.5
17	4.56	R	10.56	23.5	23.5
18	4.56	R	10.56	23.5	23.5
19	4.56	R	10.56	23.5	23.5
20	4.56	SU-1	4.56	7.5	0
21	4.56	SU-1	4.56	7.5	0
22	5.14	SU-1	5.14	15	0
23	4.56	SU-1	4.56	7.5	0
24	4.56	SU-1	4.56	7.5	0
25	4.56	SU-1	4.56	7.5	0
26	4.56	SU-1	4.56	7.5	0
27	4.56	SU-1	4.56	7.5	0
28	25.82	SU-1	25.82	38	0
29	4.56	SU-1	4.56	7.5	0
30	4.56	SU-1	4.56	7.5	0
31	12.72	SU-1	12.72	34	0
32	37.91	SU-1	37.91	39	0
33	23.13	SU-1	23.13	37	0
34	4.56	SU-1	4.56	7.5	0
35	12.94	SU-1	12.94	35	0
36	4.56	SU-1	4.56	7.5	0
37	4.56	SU-1	4.56	7.5	0
38	4.56	SU-1	4.56	7.5	0
39	4.56	SU-1	4.56	7.5	0
		Sum of the Ranks-->		780	
		Sum of the Reference Area Ranks-->			**477**

m =19 *n* =20 Alpha = .05 Critical value = 439

SURVEY UNIT 2 DIRECTS WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	6.12	R	12.12	39	39
2	4.56	R	10.56	22	22
3	7.08	R	13.08	40	40
4	4.56	R	10.56	23	23
5	4.56	R	10.56	24	24
6	4.56	R	10.56	25	25
7	5.29	R	11.29	38	38
8	4.56	R	10.56	26	26
9	4.56	R	10.56	27	27
10	4.56	R	10.56	28	28
11	4.56	R	10.56	29	29
12	4.56	R	10.56	30	30
13	4.56	R	10.56	31	31
14	4.56	R	10.56	32	32
15	4.56	R	10.56	33	33
16	4.56	R	10.56	34	34
17	4.56	R	10.56	35	35
18	4.56	R	10.56	36	36
19	4.56	R	10.56	37	37
20	4.56	SU-10	4.56	2	0
21	4.56	SU-10	4.56	3	0
22	4.56	SU-10	4.56	4	0
23	4.56	SU-10	4.56	5	0
24	4.56	SU-10	4.56	6	0
25	4.56	SU-10	4.56	7	0
26	4.56	SU-10	4.56	8	0
27	4.56	SU-10	4.56	9	0
28	5.2	SU-10	5.2	20	0
29	4.56	SU-10	4.56	10	0
30	4.56	SU-10	4.56	11	0
31	4.56	SU-10	4.56	12	0
32	0.07	SU-10	0.07	1	0
33	7.07	SU-10	7.07	21	0
34	4.56	SU-10	4.56	13	0
35	4.56	SU-10	4.56	14	0
36	4.56	SU-10	4.56	15	0
37	18.85	SU-10	18.85	41	0
38	4.56	SU-10	4.56	16	0
39	4.56	SU-10	4.56	17	0
40	4.56	SU-10	4.56	18	0
41	4.56	SU-10	4.56	19	0
		Sum of the Ranks-->		861	
	Sum of the Reference Area Ranks-->				**589**

m =19 *n* =22 Alpha = .05 Critical value = 463

SURVEY UNIT 3 DIRECTS WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	6.12	R	12.12	33	33
2	4.56	R	10.56	23.5	23.5
3	7.08	R	13.08	34	34
4	4.56	R	10.56	23.5	23.5
5	4.56	R	10.56	23.5	23.5
6	4.56	R	10.56	23.5	23.5
7	5.29	R	11.29	32	32
8	4.56	R	10.56	23.5	23.5
9	4.56	R	10.56	23.5	23.5
10	4.56	R	10.56	23.5	23.5
11	4.56	R	10.56	23.5	23.5
12	4.56	R	10.56	23.5	23.5
13	4.56	R	10.56	23.5	23.5
14	4.56	R	10.56	23.5	23.5
15	4.56	R	10.56	23.5	23.5
16	4.56	R	10.56	23.5	23.5
17	4.56	R	10.56	23.5	23.5
18	4.56	R	10.56	23.5	23.5
19	4.56	R	10.56	23.5	23.5
20	4.56	SU-3	4.56	8	0
21	4.56	SU-3	4.56	8	0
22	4.56	SU-3	4.56	8	0
23	4.56	SU-3	4.56	8	0
24	18.31	SU-3	18.31	37	0
25	4.56	SU-3	4.56	8	0
26	4.56	SU-3	4.56	8	0
27	4.56	SU-3	4.56	8	0
28	4.56	SU-3	4.56	8	0
29	4.56	SU-3	4.56	8	0
30	4.56	SU-3	4.56	8	0
31	4.56	SU-3	4.56	8	0
32	4.56	SU-3	4.56	8	0
33	4.56	SU-3	4.56	8	0
34	13.35	SU-3	13.35	35	0
35	4.56	SU-3	4.56	8	0
36	16.96	SU-3	16.96	36	0
37	4.56	SU-3	4.56	8	0
		Sum of the Ranks-->		703	
		Sum of the Reference Area Ranks-->			**475**

m =19 *n* =18 Alpha = .05 Critical value = 415

SURVEY UNIT 5 DIRECTS WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	6.12	R	12.12	38	38
2	4.56	R	10.56	27.5	27.5
3	7.08	R	13.08	39	39
4	4.56	R	10.56	27.5	27.5
5	4.56	R	10.56	27.5	27.5
6	4.56	R	10.56	27.5	27.5
7	5.29	R	11.29	36	36
8	4.56	R	10.56	27.5	27.5
9	4.56	R	10.56	27.5	27.5
10	4.56	R	10.56	27.5	27.5
11	4.56	R	10.56	27.5	27.5
12	4.56	R	10.56	27.5	27.5
13	4.56	R	10.56	27.5	27.5
14	4.56	R	10.56	27.5	27.5
15	4.56	R	10.56	27.5	27.5
16	4.56	R	10.56	27.5	27.5
17	4.56	R	10.56	27.5	27.5
18	4.56	R	10.56	27.5	27.5
19	4.56	R	10.56	27.5	27.5
20	4.56	SU-5	4.56	9	0
21	4.56	SU-5	4.56	9	0
22	4.56	SU-5	4.56	9	0
23	4.56	SU-5	4.56	9	0
24	4.56	SU-5	4.56	9	0
25	9.29	SU-5	9.29	19	0
26	4.56	SU-5	4.56	9	0
27	4.56	SU-5	4.56	9	0
28	4.56	SU-5	4.56	9	0
29	11.62	SU-5	11.62	37	0
30	4.56	SU-5	4.56	9	0
31	4.56	SU-5	4.56	9	0
32	4.56	SU-5	4.56	9	0
33	4.56	SU-5	4.56	9	0
34	4.56	SU-5	4.56	9	0
35	4.56	SU-5	4.56	9	0
36	4.56	SU-5	4.56	9	0
37	5.7	SU-5	5.7	18	0
38	4.56	SU-5	4.56	9	0
39	4.56	SU-5	4.56	9	0
		Sum of the Ranks-->		780	
		Sum of the Reference Area Ranks-->			**553**

m =19 *n* =20 Alpha = .05 Critical value = 439

SURVEY UNIT 6 DIRECTS WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	6.12	R	12.12	37	37
2	4.56	R	10.56	27.5	27.5
3	7.08	R	13.08	38	38
4	4.56	R	10.56	27.5	27.5
5	4.56	R	10.56	27.5	27.5
6	4.56	R	10.56	27.5	27.5
7	5.29	R	11.29	36	36
8	4.56	R	10.56	27.5	27.5
9	4.56	R	10.56	27.5	27.5
10	4.56	R	10.56	27.5	27.5
11	4.56	R	10.56	27.5	27.5
12	4.56	R	10.56	27.5	27.5
13	4.56	R	10.56	27.5	27.5
14	4.56	R	10.56	27.5	27.5
15	4.56	R	10.56	27.5	27.5
16	4.56	R	10.56	27.5	27.5
17	4.56	R	10.56	27.5	27.5
18	4.56	R	10.56	27.5	27.5
19	4.56	R	10.56	27.5	27.5
20	9.57	SU-6	9.57	19	0
21	4.56	SU-6	4.56	9	0
22	4.56	SU-6	4.56	9	0
23	4.56	SU-6	4.56	9	0
24	4.56	SU-6	4.56	9	0
25	4.56	SU-6	4.56	9	0
26	4.56	SU-6	4.56	9	0
27	4.56	SU-6	4.56	9	0
28	4.56	SU-6	4.56	9	0
29	4.56	SU-6	4.56	9	0
30	4.56	SU-6	4.56	9	0
31	5.72	SU-6	5.72	18	0
32	4.56	SU-6	4.56	9	0
33	4.56	SU-6	4.56	9	0
34	4.56	SU-6	4.56	9	0
35	4.56	SU-6	4.56	9	0
36	4.56	SU-6	4.56	9	0
37	4.56	SU-6	4.56	9	0
38	4.56	SU-6	4.56	9	0
			Sum of the Ranks-->	741	
			Sum of the Reference Area Ranks-->		**551**

m =19 *n* =19 Alpha = .05 Critical value = 427

SURVEY UNIT 7 DIRECTS WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	6.12	R	12.12	36	36
2	4.56	R	10.56	26.5	26.5
3	7.08	R	13.08	37	37
4	4.56	R	10.56	26.5	26.5
5	4.56	R	10.56	26.5	26.5
6	4.56	R	10.56	26.5	26.5
7	5.29	R	11.29	35	35
8	4.56	R	10.56	26.5	26.5
9	4.56	R	10.56	26.5	26.5
10	4.56	R	10.56	26.5	26.5
11	4.56	R	10.56	26.5	26.5
12	4.56	R	10.56	26.5	26.5
13	4.56	R	10.56	26.5	26.5
14	4.56	R	10.56	26.5	26.5
15	4.56	R	10.56	26.5	26.5
16	4.56	R	10.56	26.5	26.5
17	4.56	R	10.56	26.5	26.5
18	4.56	R	10.56	26.5	26.5
19	4.56	R	10.56	26.5	26.5
20	4.56	SU-7	4.56	8.5	0
21	4.56	SU-7	4.56	8.5	0
22	4.56	SU-7	4.56	8.5	0
23	4.56	SU-7	4.56	8.5	0
24	4.56	SU-7	4.56	8.5	0
25	4.56	SU-7	4.56	8.5	0
26	6.25	SU-7	6.25	17	0
27	4.56	SU-7	4.56	8.5	0
28	4.56	SU-7	4.56	8.5	0
29	4.56	SU-7	4.56	8.5	0
30	4.56	SU-7	4.56	8.5	0
31	4.56	SU-7	4.56	8.5	0
32	4.56	SU-7	4.56	8.5	0
33	4.56	SU-7	4.56	8.5	0
34	4.56	SU-7	4.56	8.5	0
35	4.56	SU-7	4.56	8.5	0
36	4.56	SU-7	4.56	8.5	0
37	6.26	SU-7	6.26	18	0
		Sum of the Ranks-->		703	
		Sum of the Reference Area Ranks-->			**532**

m =19 *n* =18 Alpha = .05 Critical value = 415

SURVEY UNIT 8 DIRECTS WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	6.12	R	12.12	37	37
2	4.56	R	10.56	26.5	26.5
3	7.08	R	13.08	38	38
4	4.56	R	10.56	26.5	26.5
5	4.56	R	10.56	26.5	26.5
6	4.56	R	10.56	26.5	26.5
7	5.29	R	11.29	35	35
8	4.56	R	10.56	26.5	26.5
9	4.56	R	10.56	26.5	26.5
10	4.56	R	10.56	26.5	26.5
11	4.56	R	10.56	26.5	26.5
12	4.56	R	10.56	26.5	26.5
13	4.56	R	10.56	26.5	26.5
14	4.56	R	10.56	26.5	26.5
15	4.56	R	10.56	26.5	26.5
16	4.56	R	10.56	26.5	26.5
17	4.56	R	10.56	26.5	26.5
18	4.56	R	10.56	26.5	26.5
19	4.56	R	10.56	26.5	26.5
20	4.56	SU-8	4.56	9	0
21	4.56	SU-8	4.56	9	0
22	13.79	SU-8	13.79	39	0
23	4.56	SU-8	4.56	9	0
24	4.56	SU-8	4.56	9	0
25	4.56	SU-8	4.56	9	0
26	11.41	SU-8	11.41	36	0
27	8.53	SU-8	8.53	18	0
28	4.56	SU-8	4.56	9	0
29	4.56	SU-8	4.56	9	0
30	4.56	SU-8	4.56	9	0
31	4.56	SU-8	4.56	9	0
32	4.56	SU-8	4.56	9	0
33	4.56	SU-8	4.56	9	0
34	4.56	SU-8	4.56	9	0
35	19.32	SU-8	19.32	40	0
36	4.56	SU-8	4.56	9	0
37	4.56	SU-8	4.56	9	0
38	4.56	SU-8	4.56	9	0
39	4.56	SU-8	4.56	9	0
40	4.56		4.56	9	0
		Sum of the Ranks-->		820	
	Sum of the Reference Area Ranks-->				**534**

m =19 *n* =21 Alpha = .05 Critical value = 451

SURVEY UNIT 9 DIRECTS WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	6.12	R	12.12	40	40
2	4.56	R	10.56	30.5	30.5
3	7.08	R	13.08	41	41
4	4.56	R	10.56	30.5	30.5
5	4.56	R	10.56	30.5	30.5
6	4.56	R	10.56	30.5	30.5
7	5.29	R	11.29	39	39
8	4.56	R	10.56	30.5	30.5
9	4.56	R	10.56	30.5	30.5
10	4.56	R	10.56	30.5	30.5
11	4.56	R	10.56	30.5	30.5
12	4.56	R	10.56	30.5	30.5
13	4.56	R	10.56	30.5	30.5
14	4.56	R	10.56	30.5	30.5
15	4.56	R	10.56	30.5	30.5
16	4.56	R	10.56	30.5	30.5
17	4.56	R	10.56	30.5	30.5
18	4.56	R	10.56	30.5	30.5
19	4.56	R	10.56	30.5	30.5
20	4.56	SU-9	4.56	11	0
21	4.56	SU-9	4.56	11	0
22	4.56	SU-9	4.56	11	0
23	4.56	SU-9	4.56	11	0
24	4.56	SU-9	4.56	11	0
25	4.56	SU-9	4.56	11	0
26	7.63	SU-9	7.63	22	0
27	4.56	SU-9	4.56	11	0
28	4.56	SU-9	4.56	11	0
29	4.56	SU-9	4.56	11	0
30	4.56	SU-9	4.56	11	0
31	4.56	SU-9	4.56	11	0
32	4.56	SU-9	4.56	11	0
33	18.57	SU-9	18.57	43	0
34	4.56	SU-9	4.56	11	0
35	4.56	SU-9	4.56	11	0
36	4.56	SU-9	4.56	11	0
37	4.56	SU-9	4.56	11	0
38	4.56	SU-9	4.56	11	0
39	4.96	SU-9	4.96	11	0
40	4.56	SU-9	4.56	11	0
41	4.56	SU-9	4.56	11	0
42	4.56	SU-9	4.56	11	0
43	22.32	SU-9	22.32	44	0
44	17.12	SU-9	17.12	42	0
		Sum of the Ranks-->		990	
	Sum of the Reference Area Ranks-->				**608**

m =19 *n* =25 Alpha = .05 Critical value = 499

01/28/13

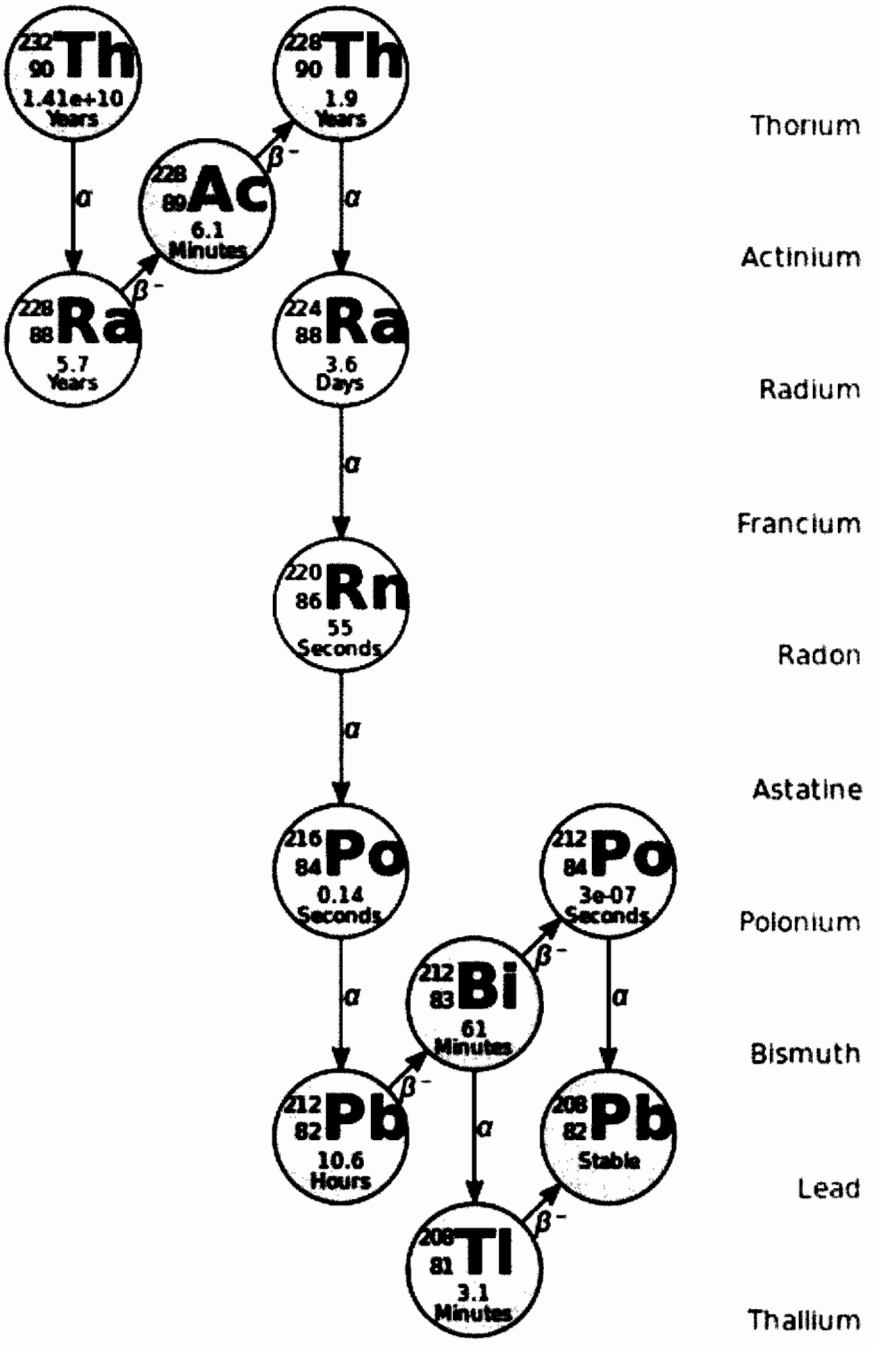
SURVEY UNIT 10 DIRECTS WRS TEST					
	DATA	AREA	ADJUSTED	RANKS	REF AREA
	dpm/100cm2		DATA		RANKS
1	6.12	R	12.12	25	25
2	4.56	R	10.56	15.5	15.5
3	7.08	R	13.08	28	28
4	4.56	R	10.56	15.5	15.5
5	4.56	R	10.56	15.5	15.5
6	4.56	R	10.56	15.5	15.5
7	5.29	R	11.29	24	24
8	4.56	R	10.56	15.5	15.5
9	4.56	R	10.56	15.5	15.5
10	4.56	R	10.56	15.5	15.5
11	4.56	R	10.56	15.5	15.5
12	4.56	R	10.56	15.5	15.5
13	4.56	R	10.56	15.5	15.5
14	4.56	R	10.56	15.5	15.5
15	4.56	R	10.56	15.5	15.5
16	4.56	R	10.56	15.5	15.5
17	4.56	R	10.56	15.5	15.5
18	4.56	R	10.56	15.5	15.5
19	4.56	R	10.56	15.5	15.5
20	39.77	SU-10	39.77	40	0
21	27.11	SU-10	27.11	38	0
22	32.86	SU-10	32.86	39	0
23	24.81	SU-10	24.81	37	0
24	20.78	SU-10	20.78	34	0
25	23.71	SU-10	23.71	36	0
26	17.52	SU-10	17.52	31	0
27	94.22	SU-10	94.22	41	0
28	-8.4	SU-10	-8.4	2.5	0
29	9.11	SU-10	9.11	6	0
30	8.93	SU-10	8.93	5	0
31	17.52	SU-10	17.52	32	0
32	-17.66	SU-10	-17.66	2.5	0
33	12.25	SU-10	12.25	26	0
34	15.69	SU-10	15.69	30	0
35	18.81	SU-10	18.81	33	0
36	12.77	SU-10	12.77	27	0
37	0.07	SU-10	0.07	2.5	0
38	22.45	SU-10	22.45	35	0
39	15.34	SU-10	15.34	29	0
40	-5.73	SU-10	-5.73	2.5	0
41	9.75	SU-10	9.75	7	0
		Sum of the Ranks-->		861	
	Sum of the Reference Area Ranks-->				**325**

m =19 *n* =22 Alpha = .05 Critical value = 463

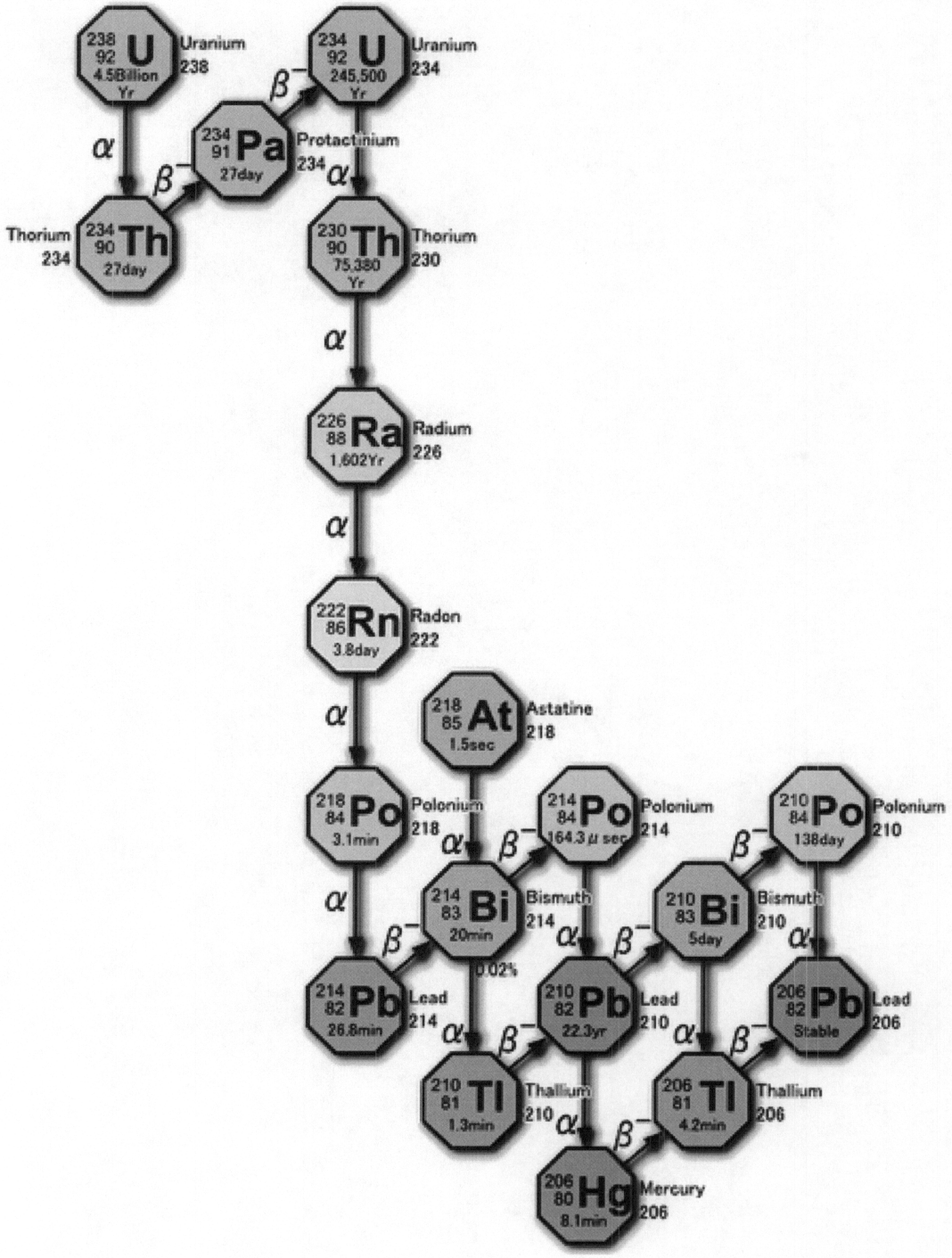
Attachment H

The Thorium and Uranium Series

The Thorium Series



The Uranium Series



This is to acknowledge the receipt of your letter/application dated

2/18/13, and to inform you that the initial processing which includes an administrative review has been performed.

Amendment (SMB-151/04060791)

[X] There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

[ ] Please provide to this office within 30 days of your receipt of this card

_____.

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 580086.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

NRC FORM 532 (RI)
(6-96)

Sincerely,
Licensing Assistance Team Leader