EL PASO ENERGY

September 25, 1998

Mr. John Wray
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

RE: Former EPEC Polymers, Inc. Facility
Industrial Avenue
Fords, Middlesex County, New Jersey

Dear Mr. Wray:

Attached please find one copy of the *Radiological Risk Analysis* report detailing the results of the dose analyses performed for the former EPEC Polymers Inc. (EPI) facility in Fords, Middlesex County, New Jersey. This report has been prepared by SECOR International Inc.(SECOR) on behalf of EPI. As per your telephone conversation on September 23, 1998, with Ravi Gupta of SECOR, EPI would like to schedule a meeting with your project staff during the week of October 26, 1998, to discuss the findings of the risk analysis and other project issues. Setting aside Monday, October 26 as a travel day, our first choice for the meeting date would be October 27 followed by October 28 or October 29. Please get back with me or Ravi Gupta regarding the actual date that NRC can accommodate the meeting.

If you should have any questions, please feel free to contact me at (713) 420-4755 or Mr. Ravi Gupta of SECOR at (609) 259-6424.

Sincerely,

Roger D. Towe

Roger D. Towe
Principal Environmental Engineer

Attachment

cc: Ravi Gupta, SECOR
Jennifer Moone, NJDEP- RAD Assess. Sec.

B/34

SECOR
International Incorporated

28 May 1997

Dr. Ronald R. Bellamy
U.S. Nuclear Regulatory Commission
475 Allendale Rd.
King of Prussia, PA 19406

RE: **Former EPEC Polymers Inc. Facility**
Industrial Avenue
Fords, Middlesex County, New Jersey
Request to Use Soil Contamination Criteria for Depleted Uranium

Dear Dr. Bellamy:

On behalf of EPEC Polymers Inc. (EPEC), SECOR International Inc. (*SECOR*) has prepared this letter to provide information to the U.S. Nuclear Regulatory Commission (USNRC) supporting EPEC's belief that the soil contamination at the above referenced site is due to depleted uranium. The surface soil sample (ISS-1) used to determine the type of uranium contamination at the site was collected at the southwest corner of Building K-12. The location of ISS-1 has the highest known exposure rate at the site. The following is the calculation used to derive the ratio of the number of atoms of U-235 to the number of atoms of U-235 plus U-238 for soil sample ISS-1:

Specific Activities

U-238 - 0.333 μCi/g of uranium
U-235 - 2.14 μCi/g of uranium
U-234 - 6.15 E+3 μCi/g of uranium

Amount of Uranium per Gram of Sample ISS-1

U-235
(43.9 pCi of U-235) / (g soil)(2.14 E+6 pCi) = 20.5 E-6 g of U-235/g soil

U-238
(2,653 pCi of U-238) / (g soil)(0.333 E+6 pCi) = 7.97 E-3 g of U-238/g soil

U-234
negligible even if in secular equilibrium

111-A North Gold Drive, Robbinsville, NJ 08691-1603 (609) 259-6424 (609) 259-0520 FAX

Atoms Ratio

Moles of U-235 = (2.05 E-5 g of U-235) / (235 g/mole) = 8.72 E-8 moles

Moles of U-238 = (7.97 E-3 g of U-238) / (238 g/mole) = 3.35 E-5 moles

(Atoms of U-235) / (Atoms of U-235 + U-238) =
(8.72 E-8 moles) / (8.72 E-8 moles + 3.35 E-5 moles) = 0.0026 = 0.26%

The atoms abundance ratio (U-235/Total Uranium) calculated by Oak Ridge for depleted uranium is 0.22%. Since the atoms abundance ratio in ISS-1 is 0.26%, the uranium contamination in ISS-1 can be attributed to depleted uranium.

To confirm the above result and conclusion, a series of 14 samples from the Building K-12 environs were counted and the concentrations of U-235 and U-238 were determined using the gamma spectroscopy system. The activity ratio of U-235-to-U-238 was calculated and the results are provided in Table 1. The U-238 concentration was inferred using the concentration of Pa-234m. The mean activity ratio in these samples is 0.031, with a standard deviation of 0.010; the activity ratio in ISS-1 is 0.017. These ratios are not significantly different, suggesting that the contamination at the site is due to depleted uranium. Therefore, EPEC requests the NRC's approval to use 35 pCi/g as the cleanup criteria at the Fords, New Jersey site.

Please contact myself or Paul Lazaar at (609) 259-6424 regarding our request.

Sincerely,
SECOR International, Inc.

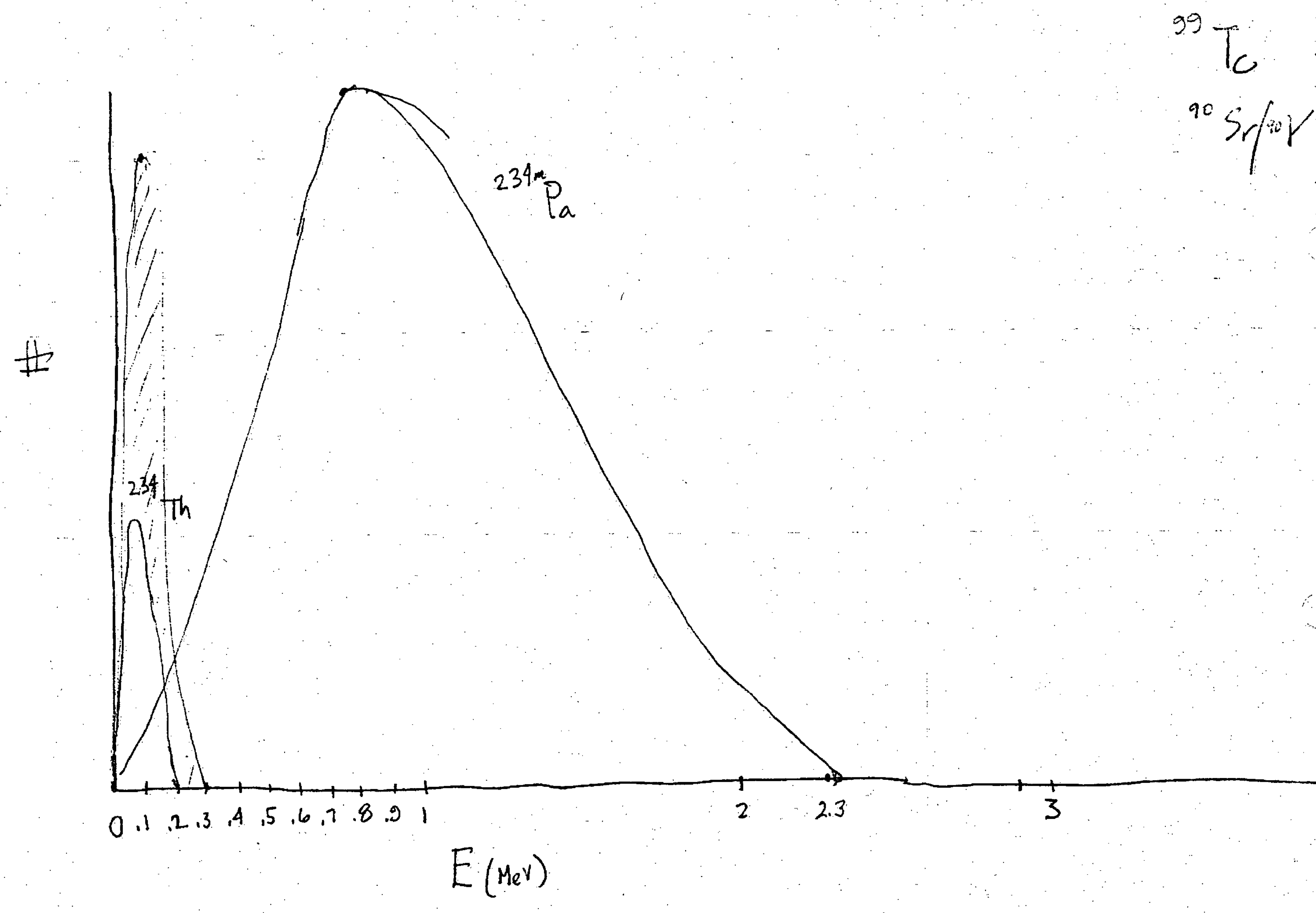
Ravi Gupta
Principal-In-Charge

c: Project File
R. Towe, EPEC
T. Jackson, USNRC
J. Wray, USNRC
P. Lazaar, *SECOR*

Table 1
Gamma Spec Sample Log
Former EPEC Polymers Inc.Facility
Industrial Avenue
Fords, Middlesex County, New Jersey

	Concentration (pCi/g)		
Sample ID	U-235	Pa-234m[1]	U-235/Pa-234m
DRM1-20B	(2.3 +/- 0.4) E+0	(9 +/- 2) E+1	0.026
DRM1-21A	(1.0 +/- 0.7) E+1	(5.7 +/- 0.3) E+2	0.018
DRM1-22A	(9.0 +/- 0.6) E+0	(3.9 +/- 0.5) E+2	0.023
DRM1-22B	(5.0 +/- 0.3) E+0	(1.5 +/- 0.2) E+2	0.033
DRM1-24B	(1.00 +/- 0.06) E+1	(3.9 +/- 0.5) E+2	0.025
DRM1-25A	(8.6 +/- 0.5) E+0	(3.3 +/- 0.3) E+2	0.026
DRM1-25B	(4.2 +/- 0.3) E+0	(1.5 +/- 0.3) E+2	0.028
DRM1-26A	(4.7 +/- 0.3) E+0	(2.0 +/- 0.3) E+2	0.024
DRUM2-2A	(3.5 +/- 0.3) E-1	(1.3 +/- 0.6) E+1	0.027
DRUM2-2B	(5.7 +/- 0.5) E-1	(1.3 +/- 0.7) E+1	0.044
DRUM2-3A	(8.1 +/- 0.5) E-1	(2.2 +/- 0.6) E+1	0.037
DRUM2-3B	(1.1 +/- 0.9) E+0	(3.2 +/- 1.1) E+1	0.037
DRUM2-4A	(6.7 +/- 0.5) E-1	(1.9 +/- 0.7) E+1	0.035
3-4	(3.9 +/- 0.4) E-1	(8 +/- 6) E+0	0.049

[1] Pa-234m is the isotope used to infer the U-238 concentration.



99 Tc
90 Sr/90 Y
234m Pa
234 Th
#
0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1
2
2.3
3
E (MeV)

6/5/97

To: Andy Schwartz

From: Jim Johnson

Subject: Detection Limit for Ludlum Model-12 end window GM

Surface Contamination Limit is $\frac{5000 \text{ dpm}}{100 \text{ cm}^2}$

If GM Efficiency is 18% then

$$\bar{\beta} = \frac{5000 \text{ dis}}{\text{min } 100 \text{ cm}^2} \times \frac{2\beta}{\text{dis}} \times \frac{0.18 \text{ c}}{\text{dis}} \times 6.4 \text{ cm}^2 = \frac{115 \text{ c}}{\text{min}}$$

∴ Use 100 cpm as limit for average over 1 m^2

10/14/97

		Backscatter factor, f_b Aluminum ≡ Concrete
^{234m}Pa	$\bar{E}_{\beta max}$ = 2.2 MeV	1.28
^{234}Th	$\bar{E}_{\beta max}$ = 0.19 MeV	1.08

$$\therefore \overline{f_b} = \frac{2.36}{2} = 1.18$$

Recalculation of surface count rate limit

C.Y. Data from 7/11/97 (^{90}Sr-Y)

$$\frac{3251\,c \quad min}{min\,(2)\,7820\,d\,(1.18)} = 17.6\%$$

$$\text{LIMIT} = \frac{5000\,d}{min}\left(\frac{2\ \beta\,dis}{\alpha\,dis}\right)\frac{0.176\,c}{dis}\ \frac{15.2\,cm^2}{100\,cm^2} =$$

$$= \frac{267\,c}{min}$$ If averaged over 1 m^2

$$\frac{800\,c}{min}$$ for any "hot spot"

(1)

10 | 13 | 97

$^{90}Sr - ^{90}Y$ source

6.02×10^3 pC @ 6 | 24 | 75 → 10 | 13 | 97

97
75
22 years + 6 J
31 J
31 A
30 S
13 O
111 days = 0.304 y

$$e^{-\frac{.693}{27.7y}(22.304)y}$$

= 0.572

$$e^{-\frac{.693}{28.1}(22.304)} = .577$$

6.02×10^3 pC × 0.572 = 3.44×10^3 pC

$= 7.644 \times 10^3 \frac{d}{min}$

^{90}Y

$E_{\beta max}$ = 2.27 MeV

$\bar{E}_\beta$ = 0.93 MeV

^{90}Sr $E_{\beta max}$ = 0.546 MeV

$\bar{E}_\beta$ = 0.182 MeV

BKG = 40 cpm

$$E = 1000 - 40 = \frac{960 \text{ cpm}}{7644 \text{ dpm}} = 0.126 \frac{c}{dis}$$

② 2

f_b for Al @ 2.27 MeV = 1.29

∴ including back scatter $S(2\pi) = 7644 \frac{d}{m} \times 1.29$

= = 9861 dpm

$$E_{ff} = \frac{960 \text{ cm}}{9861 \text{ dpm}} = 0.097$$

= 9.7% for ^{90}Y

~~If include ^{90}Sr = 19.4%~~ 44-7 Model 12

If include ^{90}Sr

$^{99}_{43}Tc$ $\frac{1,400 \text{ cpm}}{66,100 \text{ dpm}}$ = 2.1%

including back scatter

f_b stainless = 1.2

$\bar{E}_{\beta max}$ = 0.292

$\bar{E}_{\beta}$ = 0.097

$$E_{ff} = \frac{1400 \text{ cpm}}{(66,100)(1.2)} = 1.8\%$$

44-7 Model 12

SECOR 44-40

^{90}Sr

$$Eff = \frac{5682\ c}{(2)\ min\ (7{,}710\ d/m)(1.29)} = 28.6\%$$

not including back scatter = (36.8%)

should be 44%

		44-40	44-9
BKG	=	410 c / 10	408 c / 10

^{99}Tc

$$\frac{9558\ c\ /min}{66{,}100\ d\ /min} = 15.1\%$$

with backscatter 12.6%

Ludlum 38.%

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS
AMPAD

10/13/97

(4)

SECOR Ludlum Model 44-9

$$^{90}Sr\ 6.02 \times 10^{3}\ pCi \times \frac{2.22d}{m-pCi}\ @ .577 =$$

$$= 7,710\ \frac{d}{m}$$

---

^{99}Tc

$$Eff = \frac{10,156}{66,100\ (1.2)} = 12.8\%$$

(on support)

Should be 38%

$4\pi = 1/2\ 2\pi$

15.4 % c̄ no backscatter

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^{90}Sr

$$Eff = \frac{5,878\ \frac{c}{min}}{(2)_{m}\ 7,710\ \frac{d}{m/n}\ (1.29)} = 29.5\%$$

(should be 45%)

$^{90}Sr-^{90}Y$

$$Eff = \frac{5878}{(2)_{m}\ (2)\ (7,710\ \frac{d}{m})\ (1.29)} = 14.75\%$$

Post-It™ Fax Note 7671 | Date 5/27/97 | # of pages ▶ 1
To TIM KOTTAN | From Syd Porter
Dept NRC | Co. PCI
Phone # | Phone # 896-5353
Fax # 337-5269 | Fax # data - no pron

from: Ludlum Newsletter Dec 1994

From The Trenches

with David Wyatt

Note: This is part 1 of a 3 part series covering MDA time constants. Part 1 addresses linear ratemeters controlled by conventional resistor-capacitor (RC) integration components. Part 2 encompasses logarithmic ratemeters. Part 3 addresses microprocessor controlled ratemeters.

DETERMINING LINEAR ANALOG RATEMETER TIME CONSTANTS FOR MDA EQUATIONS

The following information applies to the Minimum Detectable Activity (MDA) equation (95% confidence) for linear analog ratemeter instruments - portable friskers, hand-held contamination monitors, etc.

$$\text{MDA (dpm/100 cm}^2) = \frac{4.65\sqrt{R_B/(2\tau)}}{E \cdot (A/100)}$$

where R_B = background rate (cpm), τ = counter time constant (minutes), E = counter efficiency (counts/disintegration) and A is the probe area (cm^2) [1]

DEFINITIONS

***response time:** the time interval required for the instrument reading to change from 10% to 90% of the final reading (or vice versa) following a step change in the radiation field (i.e., signal) at the detector. [2]
*Note: All LMI specified response times are measured by injecting a fixed pulse rate from a pulse generator.

time constant: the time involved in the charging or discharging of an inductor or capacitor. One time constant is the length of time required to reach 63 percent of the full charge or discharge.

The specification related to time constant in the counter instruction manual is specified as **response time** - 10% to 90% of final reading. There are 2 methods of calculating the required "counter time constant" for the MDA equation as shown below in Method A and Method B.

Method A

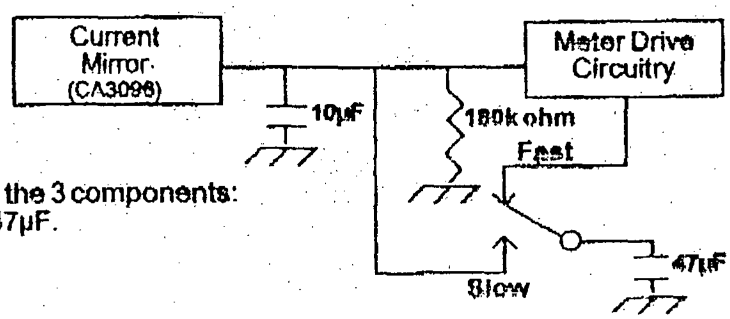
An approximate "rule of thumb" conversion from the specified response time to the required time constant is to multiply the response time data by 0.44.

Example: The Slow response position on a Ludlum Model 3 is specified at 22 seconds. 22 x 0.44 ~ time constant of 9.7 seconds = 0.16 minutes for τ.

Method B

The integration RC time constant can be calculated by multiplying R x C. There are 3 components associated with this calculation.

Example: The illustration shows the 3 components: 10µF, 180k ohm, and 47µF.



In the Fast response position the RC time constant is 10 µF (10×10^{-6}) x 180,000 ohms = 1.8 seconds or 0.03 minutes for τ. For the Slow position, the 47 µF parallels with the 10 µF = 57 µF (57×10^{-6}) x 180,000 ohms = 10.3 seconds or 0.17 minutes for τ.

Locate the integration RC components by tracing the Fast/Slow response switch or current mirror to the components or by referring to the circuit "Theory of Operation" in the Instruction Manual.

References:

[1] Gollnick, D. A.; *Basic Radiation Protection Technology*, 3rd Edition. Altadena,CA: Pacific Radiation Corpoation; April, 1994.

[2] American National Standard Performance Specifications for Health Physics Instrumentation - *Portable Instrumentation For Use In Normal Environmental Conditions. New York: Institute of Electrical and Electronic Engineers; ANSI N42.17A-1989.*