## Memorandum

Date: October 19, 2004

To: J. Strmec, Chemistry Manager

From: J. Kalb, Environmental Chemist

Subject: Estimates of off-site doses from difficult-to-measure nuclides

Reference: Dresden Off-site Dose Calculation Manual (ODCM)

Enclosure:

Unit 3 2004 dose projection including H-3, Fe-59, Sr-89, Sr-90
Unit 3 December 2004 dose projection including H-3, Fe-59, Sr-89, Sr-90

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On the recommendation of Exelon Corporate Environmental, the impact to dose received by the public from difficult to measure (DTM) nuclides as a result of the underground pipe leak was evaluated. Tritium (H-3), iron-55 (Fe-55), strontium-89 (Sr-89), and strontium-90 (Sr-90) are the DTM nuclides of concern. These nuclides are regarded as difficult to measure because they decay by weak beta emission and cannot be detected using routine gamma spectroscopy techniques. Tritium can be analyzed on site using liquid scintillation techniques; iron and strontium analyses require chemical separations that are beyond the reasonable capabilities of the on-site laboratory. In order to estimate the activity of the iron and strontium, scaling factors were derived as follows:

- Fe-55 Because liquid radwaste discharges are processed in the same manner as water processed for return to the Condensate Storage Tank (CST), Fe-55 concentration can be estimated using the scaling factor determined per CY-DR-120-600, Liquid Radwaste Scaling Factors. This method uses the average log value of actual river discharge Fe-55 analyses to determine the scaling factor in relation to Co-60. The current value, calculated on 6-17-04, is 2.68; this means for every curie of Co-60 activity present, an estimated 2.68 curies of Fe-55 is present.
- Sr-90 No Sr-90 activity was detected in liquid radwaste discharges for the past two years, so the 10CFR61 Sr-90 scaling factor (the highest 10CFR61 scaling factor available) per RP-DR-605, Waste Stream Sampling and Analysis, was used. This procedure also uses average log calculation methodology. The current value, calculated on 6-29-04, is 2.33E-03; this means for every curie of Co-60 activity present, an estimated 0.00233 curies of Sr-90 is present.
- Sr-89 No Sr-89 activity was detected in liquid radwaste discharges for the past two years, and Sr-89 scaling factors are not required by 10CFR61. Sr-89 and Sr-90 are fission products that exist in the reactor coolant in a ratio of 1.0E-04 μCi/g Sr-89 to 7.0E-06 μCi/g Sr-90 per ANSI/ANS-18.1-1999, Radioactive Source Term for Normal Operation of Light Water Reactors. Because both are isotopes of the same element, both isotopes will react chemically in the same manner, having the same removal processes and maintaining the same approximate ratio if decay is neglected. Neglecting the effects of decay is conservative for the determination of Sr-89, which has a significantly shorter half-life (50.52 days) than Sr-90 (28.78 years). For every curie of Sr-90 present, an estimated 14.29 curies of Sr-89 is present.
- H-3 The tritium concentration used for these calculations is from the 9-3-04 analysis of the CST. Tritium analysis of the CST is not performed on a routine basis. The result was 8.624E+06 pCi/L. It should be noted that this tritium concentration is for the CST, not what is released from the site, CST water is duluted by groundwater and rainwater, resulting in a lower concentration.
- Co-60 The Co-60 concentration was calculated using the average concentration of routine analyses performed since 11-12-03. Less than detectable values were not used in the calculation. The average value was 312.8 pCi/I<sub>W</sub>

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The following estimates and projections assumed a 2.0 gallon per minute (gpm) leak of CST water during the entirety of 2004 and that the filtering effects of the soil to remove these isotopes is negligible (which is čônservative). Lenke W#S

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Total volume released:  $(2.0 \text{ gpm}) \times (1440 \text{ min/day}) \times (366 \text{ days in } 2004) \times (3.785 \text{ liters / gallon}) = 3.99\text{E}+06 \text{ L}$ 

Fe-55 concentration (prior to dilution by other groundwater sources):  $(312.8 \text{ pCi/L Co-60}) \times (2.68 \text{ Ci Fe-55} / \text{Ci Co-60}) = 838.3 \text{ pCi/L Fe-55}$ Fe-55 activity:

 $(838.3 \text{ pCi/L Fe-55}) \times (3.99\text{E}+06 \text{ L}) \times (1 \text{ Ci} / 1\text{E}12 \text{ pCi}) = 3.34\text{E}-03 \text{ Ci Fe-55}$ 

Sr-90 concentration (prior to dilution by other groundwater sources):  $(312.8 \text{ pCi/L Co-60}) \times (2.33\text{E-03 Ci Sr-90 / Ci Co-60}) = 0.7288 \text{ pCi/L Sr-90}$ Sr-90 activity:

 $(0.7288 \text{ pCi/L Sr-90}) \times (3.99\text{E}+06 \text{ L}) \times (1 \text{ Ci} / 1\text{E}12 \text{ pCi}) = 2.91\text{E}-06 \text{ Ci} \text{ Sr-90} \sqrt{10}$ 

Sr-89 concentration (prior to dilution by other groundwater sources):  $(312.8 \text{ pCi/L Co-60}) \times (2.33\text{E-}03 \text{ Ci Sr-}90 / \text{Ci Co-}60) \times (14.29 \text{ Ci Sr-}89 / \text{Ci Sr-}90) = 10.41 \text{ pCi/L Sr-}89$ Sr-89 activity: Tiller, Col.

 $(10.41 \text{ pCi/L Sr-89}) \times (3.99\text{E}+06 \text{ L}) \times (1 \text{ Ci} / 1\text{E}12 \text{ pCi}) = 4.15\text{E}-05 \text{ Ci} \text{ Sr-}66$ 

Tritium concentration (prior to dilution by other groundwater sources): Analytical result from 9-3-04 of the CST: 8.624E+0 pCi/L H-3 Tritium activity:  $(8.624E+06 \text{ pCi/L H-3}) \times (3.99E+06 \text{ L}) \times (1 \text{ Ci} / 1E12 \text{ pCi}) = 34.4 \text{ Ci H-3}$ 

H-3 = 18-3 maile = 10 14/2 All of the above concentrations for Fe-55, Sr-89, and Sr-90 before dilution of natural sources, which are calculated in a very conservative manner (i.e., higher than anticipated results), are below the EPA derived limits for drinking water (which are 2000, 20, and 8 pCi/L, respectively) as well as 10CFR20, Appendix B, Table 2, Column 2 limits (which are less restrictive). The highest tritium concentration seen at the storm drains prior to release to the plant's canals was 99,000 pCi/L in DSP-132 on 9-3-04, which is also below 10CFR20 limits. The canals are not a potential drinking water supply.

To determine the dose to the public as a result of a liquid release of tritium to the environment, estimates were performed using the current ODCM methodology using the activities calculated above, again assuming a constant 2.0 gpm leak rate and no removal due to decay or the filtering effects of the soil. The dose was attributed to a continuous release from Unit 3 in December of 2004, which does not affect the calculated annual dose or critical organ. Resultant doses (in mrem) and most the conservative receptor is:

| Whole body     | 2.17E-4 | Child |
|----------------|---------|-------|
| Organ          | 2.18E-4 | Child |
| Critical organ | Liver   |       |

The following are the limits on dose from liquid effluents from Chapter 12.3.A.2 of the ODCM:

1. Less than or equal to 10 mrem to any organ during any calendar quarter.

- 2. Less than or equal to 20 mrem to any organ during any calendar year.
- 3. Less than or equal to 3 mrem to whole body during any calendar guarter.
- Less than or equal to 6 mrem to whole body during any calendar year. 4.

The calculated doses are well below all regulatory limits. Assuming a constant release rate, the annual whole body dose limit of less than or equal to 6 mrem to the whole body and 20 mrem to any organ per year are the most restrictive ODCM limits in this scenario. The dose to the public from the release of a 2.0 gpm CST leak DTM nuclides is several orders of magnitude below these limits.

# \* DELIVER TO HEALTH PHYSICS \*

## AQUATIC Effluents- 10CFR50 Listing

19-oct-2004 17:50:27

STATION:DRESDEN STATIONUNIT:3PERIOD:01/01/04 12/31/04NAME:MOOREREPORT:ANNUALMODE:ACTUAL

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ACTUAL 2004 MAXIMUM DOSES (MREM) RESULTING FROM AQUATIC EFFLUENTS PERIOD OF RELEASE - 01/01/04 TO 12/31/04 CALCULATED 10/19/04 INFANT RECEPTOR

| DOSE TYPE        | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL            | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 2.10E-04                  | 2.10E-04 |
| BODY<br>INTERNAL | 0.00 <b>E</b> +00         | 0.00E+00                  | 0.00E+00                  | 2.10E-04                  | 2.10E-04 |
| ORGAN            |                           |                           |                           | LIVER                     | LIVER    |

THIS IS A REPORT FOR THE CALENDAR YEAR 2004

COMPLIANCE STATUS - 10 CFR 50 APP. I

----- % OF APP I. ------

|       |             | OTRLY<br>OBJ | 1ST QTR<br>JAN-MAR | 2ND QTR<br>APR-JUN | 3RD QTR<br>JUL-SEP | 4TH QTR<br>OCT-DEC | YRLY<br>OBJ | % OF<br>APP. I |
|-------|-------------|--------------|--------------------|--------------------|--------------------|--------------------|-------------|----------------|
| TOTAL | BODY (MRE   | 4) 1.5       | 0.00               | 0.00               | 0.00               | 0.01               | 3.0         | 0.01           |
| CRIT. | ORGAN (MREI | 1) 5.0       | 0.00               | 0.00               | 0.00               | 0.00               | 10.0        | 0.00           |

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RESULTS BASED UPON: ODCM ANNEX REVISION 1.1 JULY 1994 ODCM SOFTWARE VERSION 1.1 January 1995 ODCM DATABASE VERSION 1.1 January 1995

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2004 ANNUAL REPORT PROJECTED DOSE AT NEAREST COMMUNITY WATER SYSTEM \* PERIOD OF RELEASE - 01/01/04 TO 12/31/04 CALCULATED 10/19/04 INFANT RECEPTOR

| DOSE TYPE | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-----------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL     | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 2.10E-04                  | 2.10E-04 |
| INTERNAL  | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 2.10E-04                  | 2.10E-04 |
| OKGAN     |                           |                           |                           | LIVER                     | LIVER    |

THIS IS A REPORT FOR THE CALENDAR YEAR 2004

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#### COMPLIANCE STATUS - 40 CFR 141

| ANNUAL LIMIT | % OF LIMIT                           |
|--------------|--------------------------------------|
| 4.0 MREM     | 0.005                                |
| 4.0 MREM     | 0.005                                |
|              | ANNUAL LIMIT<br>4.0 MREM<br>4.0 MREM |

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\* THIS CALCULATION OF DOSE IS BASED ON TECHNIQUES DESCRIBED IN THE COMMONWEALTH EDISON OFFSITE DOSE CALCULATION MANUAL. THESE TECHNIQUES DIFFER FROM THOSE DESCRIBED IN 40 CFR 141.

RESULTS BASED UPON: ODCM

ACTUAL 2004 MAXIMUM DOSES (MREM) RESULTING FROM AQUATIC EFFLUENTS PERIOD OF RELEASE - 01/01/04 TO 12/31/04 CALCULATED 10/19/04 CHILD RECEPTOR

| DOSE TYPE | 1ST<br>QUARTÉR<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-----------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL     | 0/00E+00                  | 0.00E+Q0                  | 0.00E+00                  | 2.17E-04                  | 2.17E-04 |
| INTERNAL  | 0,00E+00                  | 0.00E+00                  | 0.00E+00                  | 2.18E-04                  | 2.18E-04 |
| ORGAN     | · ·                       |                           |                           | LIVER                     | LIVER    |

THIS IS A REPORT FOR THE CALENDAR YEAR 2004

COMPLIANCE STATUS - 10 CFR 50 APP. I

----- % OF APP I. -----

|                  | QTRLY<br>OBJ | 1ST QTR<br>JAN-MAR | 2ND QTR<br>APR-JUN | 3RD QTR<br>JUL-SEP | 4TH QTR<br>OCT-DEC | YRLY<br>OBJ | % OF<br>APP. I |
|------------------|--------------|--------------------|--------------------|--------------------|--------------------|-------------|----------------|
| TOTAL BODY (MRE  | M) 1.5       | 0.00               | 0.00               | 0.00               | 0.01               | 3.0         | 0.01           |
| CRIT. ORGAN (MRE | M) 5.0       | 0.00               | 0.00               | 0.00               | 0.00               | 10.0        | 0.00           |

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RESULTS BASED UPON:

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2004 ANNUAL REPORT PROJECTED DOSE AT NEAREST COMMUNITY WATER SYSTEM \* PERIOD OF RELEASE - 01/01/04 TO 12/31/04 CALCULATED 10/19/04 CHILD RECEPTOR

| DOSE TYPE         | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL<br>BODY     | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 2.11E-04                  | 2.11E-04 |
| INTERNAL<br>ORGAN | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 2.11E-04                  | 2.11E-04 |
| •                 |                           |                           |                           | LIVER                     | LIVER    |

THIS IS A REPORT FOR THE CALENDAR YEAR 2004

COMPLIANCE STATUS - 40 CFR 141

| TYPE              | •   | • | ANNUAL LIMIT | ę | OF LIMIT |
|-------------------|-----|---|--------------|---|----------|
| TOTAL<br>BODY     | м., |   | 4.0 MREM     |   | 0.005    |
| INTERNAL<br>ORGAN |     |   | 4.0 MREM     |   | 0.005    |

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\* THIS CALCULATION OF DOSE IS BASED ON TECHNIQUES DESCRIBED IN THE COMMONWEALTH EDISON OFFSITE DOSE CALCULATION MANUAL. THESE TECHNIQUES DIFFER FROM THOSE DESCRIBED IN 40 CFR 141.

RESULTS BASED UPON:

ACTUAL 2004 MAXIMUM DOSES (MREM) RESULTING FROM AQUATIC EFFLUENTS PERIOD OF RELEASE - 01/01/04 TO 12/31/04 CALCULATED 10/19/04 TEENAGER RECEPTOR

| DOSE TYPE         | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL<br>BODY     | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.16E-04                  | 1.16E-04 |
| INTERNAL<br>ORGAN | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.17E-04                  | 1.17E-04 |
|                   |                           |                           |                           | LIVER                     | LIVER    |

THIS IS A REPORT FOR THE CALENDAR YEAR 2004

COMPLIANCE STATUS - 10 CFR 50 APP. I

----- % OF APP I. -----

|       |       |        | QTRLY<br>OBJ | 1ST QTR<br>JAN-MAR | 2ND QTR<br>APR-JUN | 3RD QTR<br>JUL-SEP | 4TH QTR<br>OCT-DEC | YRLY<br>OBJ | % OF<br>APP. I |
|-------|-------|--------|--------------|--------------------|--------------------|--------------------|--------------------|-------------|----------------|
| TOTAL | BODY  | (MREM) | 1.5          | 0.00               | 0.00               | 0.00               | 0.01               | 3.0         | 0.00           |
| CRIT. | ORGAN | (MREM) | 5.0          | 0.00               | 0.00               | 0.00               | 0.00               | 10.0        | 0.00           |

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RESULTS BASED UPON:

2004 ANNUAL REPORT PROJECTED DOSE AT NEAREST COMMUNITY WATER SYSTEM \* PERIOD OF RELEASE - 01/01/04 TO 12/31/04 CALCULATED 10/19/04 TEENAGER RECEPTOR

| DOSE TYPE     | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|---------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL<br>BODY | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.10E-04                  | 1.10E-04 |
| INTERNAL      | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.10E-04                  | 1.10E-04 |
|               |                           |                           |                           | LIVER                     | LIVER    |

THIS IS A REPORT FOR THE CALENDAR YEAR 2004

#### COMPLIANCE STATUS - 40 CFR 141

| TYPE     | ANNUAL LIMIT | % OF LIMIT |
|----------|--------------|------------|
| TOTAL    | 4.0 MREM     | 0.003      |
| BODY     |              |            |
| INTERNAL | 4.0 MREM     | 0.003      |
| ORGAN    |              |            |

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\* THIS CALCULATION OF DOSE IS BASED ON TECHNIQUES DESCRIBED IN THE COMMONWEALTH EDISON OFFSITE DOSE CALCULATION MANUAL. THESE TECHNIQUES DIFFER FROM THOSE DESCRIBED IN 40 CFR 141.

**RESULTS BASED UPON:** 

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ACTUAL 2004 MAXIMUM DOSES (MREM) RESULTING FROM AQUATIC EFFLUENTS PERIOD OF RELEASE - 01/01/04 TO 12/31/04 CALCULATED 10/19/04 ADULT RECEPTOR

| DOSE TYPE         | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL<br>BODY     | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.64E-04                  | 1.64E-04 |
| INTERNAL<br>ORGAN | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.65E-04                  | 1.65E-04 |
| 0110121           | •                         |                           |                           | LIVER                     | LIVER    |

THIS IS A REPORT FOR THE CALENDAR YEAR 2004

#### COMPLIANCE STATUS - 10 CFR 50 APP. I

----- % OF APP I. -----

|       |       |        | QTRLY<br>OBJ | 1ST QTR<br>JAN-MAR | 2ND QTR<br>APR-JUN | 3RD QTR<br>JUL-SEP | 4TH QTR<br>OCT-DEC | YRLY<br>OBJ | % OF<br>APP. I |
|-------|-------|--------|--------------|--------------------|--------------------|--------------------|--------------------|-------------|----------------|
| TOTAL | BODY  | (MREM) | 1.5          | 0.00               | 0.00               | 0.00               | 0.01               | 3.0         | 0.01           |
| CRIT. | ORGAN | (MREM) | 5.0          | 0.00               | 0.00               | 0.00               | 0.00               | 10.0        | 0.00           |
|       |       |        |              |                    |                    |                    |                    |             |                |

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RESULTS BASED UPON:

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2004 ANNUAL REPORT PROJECTED DOSE AT NEAREST COMMUNITY WATER SYSTEM \* PERIOD OF RELEASE - 01/01/04 TO 12/31/04 CALCULATED 10/19/04 ADULT RECEPTOR

| DOSE TYPE | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-----------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL     | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.56E-04                  | 1.56E-04 |
| INTERNAL  | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.56E-04                  | 1.56E-04 |
| ORGAN     |                           |                           |                           | LIVER                     | LIVER    |

THIS IS A REPORT FOR THE CALENDAR YEAR 2004

COMPLIANCE STATUS - 40 CFR 141

| TYPE     | ANNUAL LIMIT | % OF LIMIT |
|----------|--------------|------------|
| TOTAL    | 4.0 MREM     | 0.004      |
| INTERNAL | 4.0 MREM     | 0.004      |

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\* THIS CALCULATION OF DOSE IS BASED ON TECHNIQUES DESCRIBED IN THE COMMONWEALTH EDISON OFFSITE DOSE CALCULATION MANUAL. THESE TECHNIQUES DIFFER FROM THOSE DESCRIBED IN 40 CFR 141.

RESULTS BASED UPON:

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#### AQUATIC Effluents - 10CFR50 Listing

STATION:DRESDEN STATIONUNIT:3PERIOD:12/01/04 12/31/04NAME:MOOREREPORT:MONTHLYMODE:ACTUAL

For INFANT dose calculations, the included pathways are:

DRINKING WATER

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For ADULT dose calculations, the included pathways are: DRINKING WATER FISH

| NUCLIDES | (uCURIES) |
|----------|-----------|
| NUCLIDE  | VALUE     |
|          |           |
| H-3      | 3.44E+07  |
| Fe-55    | 3.34E+03  |
| Sr-89    | 4.15E+01  |
| Sr-90    | 2.91E+00  |

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ACTUAL 2004 MAXIMUM DOSES (MREM) RESULTING FROM AQUATIC EFFLUENTS PERIOD OF RELEASE - 12/01/04 TO 12/31/04 CALCULATED 10/19/04 INFANT RECEPTOR DATABASE CONTAINS DATA THROUGH 12/31/04

2ND 3RD CURRENT 1ST 4 THQUARTER QUARTER QUARTER DOSE TYPE MONTH OUARTER ANNUAL JAN-MAR APR-JUN JUL-SEP OCT-DEC 2.10E-04 0.00E+00 0.00E+00 TOTAL 0.00E+00 2.10E-04 2.10E-04 BODY INTERNAL 2.10E-04 0.00E+00 0.00E+00 0.00E+00 2.10E-04 2.10E-04 ORGAN LIVER LIVER LIVER

THIS REPORT CONTAINS RELEASES FOR THE FOURTH QUARTER

COMPLIANCE STATUS - 10 CFR 50 APP. I

----- % OF APP I. ------

| -     |       |        | QTRLY<br>OBJ | 1ST QTR<br>JAN-MAR | 2ND QTR<br>APR-JUN | 3RD QTR<br>JUL-SEP | 4TH QTR<br>OCT-DEC | YRLY<br>OBJ | % OF<br>APP. I |
|-------|-------|--------|--------------|--------------------|--------------------|--------------------|--------------------|-------------|----------------|
| TOTAL | BODY  | (MREM) | 1.5          | 0.00               | 0.00               | 0.00               | 0.01               | 3.0         | 0.01           |
| CRIT. | ORGAN | (MREM) | 5.0          | 0.00               | 0.00               | 0.00               | 0.00               | 10.0        | 0.00           |

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ACTUAL 2004 PROJECTED DOSE AT NEAREST COMMUNITY WATER SYSTEM \* PERIOD OF RELEASE - 12/01/04 TO 12/31/04 CALCULATED 10/19/04 INFANT RECEPTOR DATABASE CONTAINS DATA THROUGH 12/31/04

CURRENT 1ST 2ND 3RD 4 THOUARTER OUARTER QUARTER ANNUAL DOSE TYPE MONTH QUARTER JAN-MAR APR-JUN JUL-SEP OCT-DEC TOTAL 0.00E+00 0.00E+00 2.10E-04 0.00E+00 2.10E-04 2.10E-04 BODY INTERNAL 2.10E-04 0.00E+00 0.00E+00 0.00E+00 2.10E-04 2.10E-04 ORGAN LIVER LIVER LIVER

THIS REPORT CONTAINS RELEASES FOR THE FOURTH QUARTER

#### COMPLIANCE STATUS - 40 CFR 141

| TYPE     | ANNUAL LIMIT | % OF LIMIT |
|----------|--------------|------------|
| TOTAL    | 4.0 MREM     | 0.005      |
| INTERNAL | 4.0 MREM     | 0.005      |
| ORGAN    |              |            |

#### LIVER

\* THIS CALCULATION OF DOSE IS BASED ON TECHNIQUES DESCRIBED IN THE COMMONWEALTH EDISON OFFSITE DOSE CALCULATION MANUAL. THESE TECHNIQUES DIFFER FROM THOSE DESCRIBED IN 40 CFR 141.

| RESULTS | BASED | UPON: | ODCM | ANNEX  | RE  | <b>JISION</b> | 1.1 | JULY 199 | 94   |
|---------|-------|-------|------|--------|-----|---------------|-----|----------|------|
|         |       |       | ODCM | SOFTWA | ARE | VERSION       | 1.1 | January  | 1995 |
|         |       |       | ODCM | DATABA | ASE | VERSION       | 1.1 | January  | 1995 |

ACTUAL 2004 MAXIMUM DOSES (MREM) RESULTING FROM AQUATIC EFFLUENTS PERIOD OF RELEASE - 12/01/04 TO 12/31/04 CALCULATED 10/19/04 CHILD RECEPTOR DATABASE CONTAINS DATA THROUGH 12/31/04

| DOSE TYPE         | CURRENT<br>MONTH | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-------------------|------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL<br>BODY     | 2,17E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 2.17E-04                  | 2.17E-04 |
| INTERNAL<br>ORGAN | 2.18E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 2.18E-04                  | 2.18E-04 |
|                   | LIVER            |                           |                           |                           | LIVER                     | LIVER    |

THIS REPORT CONTAINS RELEASES FOR THE FOURTH QUARTER

## COMPLIANCE STATUS - 10 CFR 50 APP. I

----- % OF APP I. ------

|       |       |        | QTRLY<br>OBJ | 1ST QTR<br>JAN-MAR | 2ND QTR<br>APR-JUN | 3RD QTR<br>JUL-SEP | 4TH QTR<br>OCT-DEC | YRLY<br>OBJ | ∛ OF<br>APP. I |
|-------|-------|--------|--------------|--------------------|--------------------|--------------------|--------------------|-------------|----------------|
| TOTAL | BODY  | (MREM) | 1.5          | 0.00               | 0.00               | 0.00               | 0.01               | 3.0         | 0.01           |
| CRIT. | ORGAN | (MREM) | 5.0          | 0.00               | 0.00               | 0.00               | 0.00               | 10.0        | 0.00           |

LIVER LIVER

ACTUAL 2004 PROJECTED DOSE AT NEAREST COMMUNITY WATER SYSTEM \* PERIOD OF RELEASE - 12/01/04 TO 12/31/04 CALCULATED 10/19/04 CHILD RECEPTOR DATABASE CONTAINS DATA THROUGH 12/31/04

| DOSE TYPE         | CURRENT<br>MONTH | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-------------------|------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL             | 2.11E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 2.11E-04                  | 2.11E-04 |
| INTERNAL<br>ORGAN | 2.11E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 2.11E-04                  | 2.11E-04 |
| Olional and       | LIVER            |                           |                           |                           | LIVER                     | LIVER    |

THIS REPORT CONTAINS RELEASES FOR THE FOURTH QUARTER

COMPLIANCE STATUS - 40 CFR 141

| TYPE              | ANNUAL LIMIT | % OF LIMIT |
|-------------------|--------------|------------|
| TOTAL             | 4.0 MREM     | 0.005      |
| INTERNAL<br>ORGAN | 4.0 MREM     | 0.005      |

LIVER

\* THIS CALCULATION OF DOSE IS BASED ON TECHNIQUES DESCRIBED IN THE COMMONWEALTH EDISON OFFSITE DOSE CALCULATION MANUAL. THESE TECHNIQUES DIFFER FROM THOSE DESCRIBED IN 40 CFR 141.

| RESULTS | BASED   | UPON: | ODCM | ANNEX  | REV | VISION  | 1.1 | JULY 199 | 4    |
|---------|---------|-------|------|--------|-----|---------|-----|----------|------|
|         |         |       | ODCM | SOFTWA | RE  | VERSION | 1.1 | January  | 1995 |
|         | · · · , | •     | ODCM | DATABA | SE  | VERSION | 1.1 | January  | 1995 |

ACTUAL 2004 MAXIMUM DOSES (MREM) RESULTING FROM AQUATIC EFFLUENTS PERIOD OF RELEASE - 12/01/04 TO 12/31/04 CALCULATED 10/19/04 TEENAGER RECEPTOR DATABASE CONTAINS DATA THROUGH 12/31/04

| DOSE TYPE         | CURRENT<br>MONTH | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-------------------|------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL<br>BODY     | 1.16E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.16E-04                  | 1.16E-04 |
| INTERNAL<br>ORGAN | 1.17E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.17E-04                  | 1.17E-04 |
|                   | LIVER            |                           |                           |                           | LIVER                     | LIVER    |

THIS REPORT CONTAINS RELEASES FOR THE FOURTH QUARTER

COMPLIANCE STATUS - 10 CFR 50 APP. I

----- % OF APP I. ------

|       |       |        | QTRLY<br>OBJ | 1ST QTR<br>JAN-MAR | 2ND QTR<br>APR-JUN | 3RD QTR<br>JUL-SEP | 4TH QTR<br>OCT-DEC | YRLY<br>OBJ | * OF<br>APP. I |
|-------|-------|--------|--------------|--------------------|--------------------|--------------------|--------------------|-------------|----------------|
| TOTAL | BODY  | (MREM) | 1.5          | 0.00               | 0.00               | 0.00               | 0.01               | 3.0         | 0.00           |
| CRIT. | ORGAN | (MREM) | 5.0          | 0.00               | 0.00               | 0.00               | 0.00               | 10.0        | 0.00           |

LIVER

RESULTS BASED UPON:

\*\* 1

ODCM ANNEX REVISION 1.1 JULY 1994 ODCM SOFTWARE VERSION 1.1 January 1995 ODCM DATABASE VERSION 1.1 January 1995

LIVER

ACTUAL 2004 PROJECTED DOSE AT NEAREST COMMUNITY WATER SYSTEM \* PERIOD OF RELEASE - 12/01/04 TO 12/31/04 CALCULATED 10/19/04 TEENAGER RECEPTOR DATABASE CONTAINS DATA THROUGH 12/31/04

| DOSE TYPE         | CURRENT<br>MONTH | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-------------------|------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL             | 1.10E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.10E-04                  | 1.10E-04 |
| INTERNAL<br>ORGAN | 1.10E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.10E-04                  | 1.10E-04 |
|                   | LIVER            |                           | ·                         |                           | LIVER                     | LIVER    |

THIS REPORT CONTAINS RELEASES FOR THE FOURTH QUARTER

COMPLIANCE STATUS - 40 CFR 141

| TYPE              |              | ·     | ANNUAL LIMIT | % OF LIMIT |
|-------------------|--------------|-------|--------------|------------|
| TOTAL<br>BODY     | $\checkmark$ | • • • | 4.0 MREM     | 0.003      |
| INTERNAL<br>ORGAN |              |       | 4.0 MREM     | 0.003      |

LIVER

\* THIS CALCULATION OF DOSE IS BASED ON TECHNIQUES DESCRIBED IN THE COMMONWEALTH EDISON OFFSITE DOSE CALCULATION MANUAL. THESE TECHNIQUES DIFFER FROM THOSE DESCRIBED IN 40 CFR 141.

| RESULTS | BASED | UPON:       | ODCM | ANNEX  | RE\        | /ISION  | 1.1 | JULY 199 | 4    |
|---------|-------|-------------|------|--------|------------|---------|-----|----------|------|
|         |       |             | ODCM | SOFTW  | <b>ARE</b> | VERSION | 1.1 | January  | 1995 |
|         |       | · · · · · · | ODCM | DATABA | ASE        | VERSION | 1.1 | January  | 1995 |

ACTUAL 2004 MAXIMUM DOSES (MREM) RESULTING FROM AQUATIC EFFLUENTS PERIOD OF RELEASE - 12/01/04 TO 12/31/04 CALCULATED 10/19/04 ADULT RECEPTOR

DATABASE CONTAINS DATA THROUGH 12/31/04

| DOSE TYPE         | CURRENT<br>MONTH | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-------------------|------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL<br>BODY     | 1.64E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.64E-04                  | 1.64E-04 |
| INTERNAL<br>ORGAN | 1.65E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.65E-04                  | 1.65E-04 |
|                   | LIVER            |                           |                           |                           | LIVER                     | LIVER    |

THIS REPORT CONTAINS RELEASES FOR THE FOURTH QUARTER

COMPLIANCE STATUS - 10 CFR 50 APP. I

----- % OF APP I. -----

|       |       |        | QTRLY<br>OBJ | 1ST QTR<br>JAN-MAR | 2ND QTR<br>APR-JUN | 3RD QTR<br>JUL-SEP | 4TH QTR<br>OCT-DEC | YRLY<br>OBJ | % OF<br>APP. I |
|-------|-------|--------|--------------|--------------------|--------------------|--------------------|--------------------|-------------|----------------|
| TOTAL | BODY  | (MREM) | 1.5          | 0.00               | 0.00               | 0.00               | 0.01               | 3.0         | 0.01           |
| CRIT. | ORGAN | (MREM) | 5.0          | 0.00               | 0.00               | 0.00               | 0.00               | 10.0        | 0.00           |

LIVER LIVER

RESULTS BASED UPON:

ACTUAL 2004 PROJECTED DOSE AT NEAREST COMMUNITY WATER SYSTEM \* PERIOD OF RELEASE - 12/01/04 TO 12/31/04 CALCULATED 10/19/04 ADULT RECEPTOR DATABASE CONTAINS DATA THROUGH 12/31/04

| DOSE TYPE | CURRENT<br>MONTH | 1ST<br>QUARTER<br>JAN-MAR | 2ND<br>QUARTER<br>APR-JUN | 3RD<br>QUARTER<br>JUL-SEP | 4TH<br>QUARTER<br>OCT-DEC | ANNUAL   |
|-----------|------------------|---------------------------|---------------------------|---------------------------|---------------------------|----------|
| TOTAL     | 1.56E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.56E-04                  | 1.56E-04 |
| INTERNAL  | 1.56E-04         | 0.00E+00                  | 0.00E+00                  | 0.00E+00                  | 1.56E-04                  | 1.56E-04 |
|           | LIVER            |                           |                           |                           | LIVER                     | LIVER    |

THIS REPORT CONTAINS RELEASES FOR THE FOURTH QUARTER

#### COMPLIANCE STATUS - 40 CFR 141

| TYPE     | ANNUAL LIMIT | % OF LIMIT |
|----------|--------------|------------|
| TOTAL    | 4.0 MREM     | 0.004      |
| BODY     |              |            |
| INTERNAL | 4.0 MREM     | 0.004      |
| ORGAN    | ·            |            |

LIVER

\* THIS CALCULATION OF DOSE IS BASED ON TECHNIQUES DESCRIBED IN THE COMMONWEALTH EDISON OFFSITE DOSE CALCULATION MANUAL. THESE TECHNIQUES DIFFER FROM THOSE DESCRIBED IN 40 CFR 141.

| RESULTS | BASED | UPON: | ODCM | ANNEX  | REV | ISION   | 1.1 | JULY 199 | €4   |
|---------|-------|-------|------|--------|-----|---------|-----|----------|------|
|         |       |       | ODCM | SOFTW  | ARE | VERSION | 1.1 | January  | 1995 |
|         |       |       | ODCM | DATABA | ASE | VERSION | 1.1 | January  | 1995 |

|            |                  | Leakage rate (gpm) | 0.5        | 2         | 0.5 2               |
|------------|------------------|--------------------|------------|-----------|---------------------|
|            |                  | Volume (gal)       | 263520     | 1054080   | _                   |
|            |                  | Volume (L)         | 997423.2 · | 3989692.8 |                     |
| Scaling fa | actors (6-29-04) | CST (uCi/ml)       | Activity   | / (uCi)   | Activity (Ci)       |
| Co-60      | NA               | 3.128E-07          | . ,        |           |                     |
| H-3        | NA               | 8.624E-03          | 8.602E+06  | 3.441E+07 | 8.602E+00 3.441E+01 |
| Fe-55      | 2.68             | 8.383E-07          | 8.361E+02  | 3.344E+03 | 8 361E-04 3 344E-03 |
| Sr-89      | 3.33E-02         | 1.041E-08          | 1.038E+01  | 4.154E+01 | 1.038E-05 4.154E-05 |
| Sr-90      | 2.33E-03         | 7.288E-10          | 7.269E-01  | 2.908E+00 | 7.269E-07 2.908E-06 |

. . •

|                                |                                | 01.1           |          |
|--------------------------------|--------------------------------|----------------|----------|
| ì                              | milling x                      | 1E9 = 14/2     |          |
| •                              |                                |                |          |
|                                |                                |                |          |
| 2/3 CST Co-60 (uCi/ml)         |                                |                | 7 515 00 |
| 10/08/04 01:00 6.55E-08        | <u>06/16/04 01:40 1.08E-00</u> | 02/00/04 00:10 | A 42E 00 |
| 10/08/04 01:00 9.25E-08        | U6/14/U4 U2:25 2.94E-U6        | 02/04/04 04:45 | 5 02E 00 |
| 10/06/04 00:15                 | 06/11/04 01:30 9.01E-07        | 02/02/04 02:50 | 7 795 00 |
| 10/04/04 02:00 5.80E-08        | 06/09/04 00:15 2.01E-07        | 02/02/04 02:50 | 1 555 07 |
| 09/30/04 23:01                 | 06/07/04 01:45 9.83E-06        | 01/30/04 00:00 | 1.00E-07 |
| 09/29/04 15:20                 | 06/04/04 00:15 1.11E-07        | 01/2//04 23:05 | 9.02E-00 |
| 09/26/04 21:30 9.04E-08        | 06/02/04 00:55 2.52E-07        | 01/20/04 23:10 | 1.12E-07 |
| 09/23/04 23:30                 | 05/31/04 00:15 3.32E-07        | 01/25/04 23:50 | 1.02E-U/ |
| 09/22/04 00:05                 | 05/28/04 01:16 2.5/E-0/        | 01/23/04 00:25 | 0.04E-00 |
| 09/20/04 00:15                 | 05/26/04 00:20 8.13E-07        | 01/21/04 00:25 | 7.0/E-00 |
| <u>09/17/04 00:06 8.28E-08</u> | 05/24/04 00:20 4.82E-0/        | 01/18/04 21:30 | 1 115 03 |
| <u>09/15/04 00:20 6.38E-08</u> | 05/21/04 00:10 2.01E-0/        | 01/16/04 00:10 | 1.11E-07 |
| 09/13/04 00:15                 | 05/19/04 00:05 1.69E-07        | 01/16/04 01:30 | 4.32E-0/ |
| 09/10/04 00:03 1.65E-07        | 05/1//04 00:15 1.7/E-0/        | 01/14/04 02:00 | 1.50E-07 |
| 09/08/04 00:07                 | 05/1//04 00:15 2.36E-0/        |                | 3.80E-07 |
| 09/06/04 01:30                 | 05/14/04 16:05 2.48E-0/        |                | 4.35E-07 |
| 09/03/04 01:15                 | 05/12/04 00:38 3.6/E-0/        |                | 3.10E-U/ |
| 09/01/04 02:10 1.30E-07        | 05/06/04 18:10 2.26E-0/        | 01/05/04 00:20 | 3.32E-07 |
| 08/30/04 01:15                 | 05/04/04 19:50 7.8 TE-08       |                | 4.21E-0/ |
| 08/27/04 00:05                 | 05/03/04 01:00 9.2/E-08        |                | 3.92E-07 |
| 08/25/04 03:39                 | 04/29/04 23:29 2.95E-07        |                | 3.40E-07 |
| 08/23/04 00:08 8.70E-08        | 04/28/04 00:14 1./9E-0/        | 12/23/03 22:25 | 8.40E-0/ |
| 08/20/04 00:10 2.39E-07        | 04/26/04 00:12                 | 12/21/03 22:20 | 1.04E-00 |
| 08/18/04 08:00                 | 04/19/04 00:35                 |                | 1.3/E-UC |
| 08/16/04 02:00                 | 04/16/04 00:10                 | 12/16/03 23:30 | 1.24E-UC |
| 08/12/04 14:15                 | 04/14/04 00:20 2.64E-07        |                | 2.19E-07 |
| 08/08/04 23:30 1.3/E-0/        | 04/12/04 01:00 3.85E-07        | 12/14/03 19:00 | 2.91E-07 |
| 08/06/04 00:20 1.13E-0/        | 04/09/04 04:05 0.00E-08        | 12/13/03 22:02 | 2.04E-07 |
| 08/04/04 00:00 1.10E-0/        | 04/09/04 01:40                 | 12/13/03 00:50 | 2.00E-U/ |
| <u>08/02/04 00:10 8.46E-08</u> |                                | 12/12/03 00:03 | 2.04E-07 |
| 07/29/04 23:15                 |                                | 12/11/03 08:55 | 2.05E-07 |
| 07/28/04 00:30                 | 04/02/04 01:05 1.72E-07        | 12/08/03 00:15 | 2.01E-07 |
| 07/26/04 00:25 1.21E-0/        | 03/31/04 01:30 1.40E-07        | 12/05/03 00:00 | 2.40E-07 |
| 07/23/04 00:05 1.33E-0/        | 03/31/04 01:30 1.14E-07        |                | 1.99E-07 |
| 07/21/04 00:05 1.89E-07        | 03/29/04 02:30 1.57E-07        | 12/01/03 00:10 | 1.02E-07 |
| U//19/04 00:55 1.3/E-0/        | 03/24/04 00:37 1.30E-07        | 11/20/03 00.15 | 2.205-07 |
| U//19/04 00:15 1.3/E-U/        | US/22/04 US:00 1.50E-07        | 11/20/03 00:05 | 2.020-07 |
| 07/15/04 23:05 2.08E-07        | 03/10/04 23:10 1.30E-07        | 11/24/03 00.15 | 3 000 07 |
| 0//13/04 23:04 1.94E-0/        | 02/14/04 02:45 1 175 07        | 11/20/03 23:30 | 1 60E 07 |
| 0//11/04 23:04 1.04E-0/        | 03/14/04 23:45 1.1/E-0/        | 11/16/03 23.10 | 4.000-07 |
| U//U9/U4 UU: 14 2.60E-U/       |                                | 11/10/03 23:30 | 4.4/E-U/ |
| U//U//U4 UU: IUI 2.8 IE-U/     | U3/10/04 01:14 9.02E-08        |                | 0.1/E-U/ |

03/08/04 00:43 1.13E-07

03/03/04 01:00

03/01/04 02:10

02/27/04 05:30

02/25/04 00:55

02/20/04 00:35 02/18/04 00:00

02/11/04 00:38 02/09/04 00:47

07/05/04 00:00 3.33E-07

07/02/04 02:36 1.84E-07

06/30/04 05:06 2.70E-07

06/28/04 04:08 3.89E-07 06/28/04 00:15 5.80E-07

06/24/04 23:30 5.92E-07

06/23/04 00:00 6.09E-07 06/20/04 23:40 7.47E-07

06/18/04 01:10 1.10E-06

Average

3.1279E-07

RP-DR-605 Revision 0 Page 17 of 18

## DATA SHEET 4

## SCALING FACTOR RESULTS

Waste Stream(s) U13 RESID (RUCU ADD COODED SATE)

.)

| Base Nuclide                   | Scaled Nuclide    | Scaling Factor                     |
|--------------------------------|-------------------|------------------------------------|
| Co-60                          | C-14              | 1.815-2                            |
| Co-60                          | Fe-55             | 1.40                               |
| Co-60                          | Ni-63             | 2.44 E-2                           |
| 60-60                          | Sr-90             | 2.33E-3                            |
| 6-60<br><del>- TE-995.</del> 0 | Tc-99             | 2.45E-3                            |
| G-60                           | I-129             | NA RECENT<br>LLO VALUE WILL GEUSER |
| 60-60                          | Pu-239            | 1.128-5                            |
| Pu-239                         | Pu-238            | 1.19                               |
| Pu-239<br>Pu-244               | Pu-241            | 1.10 E+Z                           |
| lu-239                         | Am-241            | 177                                |
| Pu-239                         | Cm-242            | 1.04                               |
| Pu-239                         | CH-243/<br>Cm-244 | 2,58 E-1                           |
|                                |                   |                                    |

6 129/04

Prepared B 6.29.04

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Reviewed By:

CY-DR-120-600 Revision 1 | Page 6 of 6 Level 3 – Information Use

#### DATA SHEET 3

#### LIQUID DISCHARGE SCALING FACTOR SUMMARY

| Nuclide Ratio | Scaling factor |  |
|---------------|----------------|--|
| Fe-55/Co-60   | 2.68           |  |
| Sr-89/Co-60   | Ö              |  |
| Sr-90/Co-60   | 0              |  |

- 16.17.04 Denger / 4/17/04 Prepared by/Date: Reviewed by/Date:

## DATA SHEET 1

## LIQUID RADWASTE SCALING FACTOR DETERMINATION WORKSHEET

Difficult to Measure (DTM) Radionuclide (Circle):

Fe-55

Sr-89 Sr-90

| Date      | Co-60 uCi/ml | DTM uCi/ml | Ratio DTM /Co-60 | Log(DTM/Co-60) | Log Upper range | Log Lower Range | Outlier (yes or no) |
|-----------|--------------|------------|------------------|----------------|-----------------|-----------------|---------------------|
| 20-Jul-02 | 1.684E-06    | 6.540E-06  | 3.884E+00        | 0.5893         | 1.4285          | -0.5715         | no                  |
| 14-Aug-02 | 6.209E-07    | LLD        | N/A              | N/A            | 1.4285          | -0.5715         | N/A                 |
| 12-Sep-02 | 1.745E-06    | 3.300E-06  | 1.891E+00        | 0.2766         | 1.4285          | -0.5715         | no                  |
| 19-Oct-02 | 7.676E-07    | LLD        | N/A              | N/A            | 1.4285          | -0.5715         | N/A                 |
| 7-Nov-02  | 1.640E-07    | LLD        | N/A              | N/A            | 1.4285          | -0.5715         | N/A                 |
| 13-Jan-03 | 1.698E-07    | LLD        | N/A              | N/A            | 1.4285          | -0.5715         | N/A                 |
| 3-Feb-03  | 2.809E-07    | 7.380E-07  | 2.628E+00        | 0.4196         | 1.4285          | -0.5715         | no                  |
|           |              |            | 1                |                | 1               | -               |                     |

Average of Logs 0.4285

Scaling Factor 2.68E+00

17-04 Prepared By <u>ch12/04</u> Reviewed B

## DATA SHEET 1

## LIQUID RADWASTE SCALING FACTOR DETERMINATION WORKSHEET

Difficult to Measure (DTM) Radionuclide (Circle):

Fe-55 Sr-89

| 01-30    |   |
|----------|---|
| <b>x</b> | _ |
|          |   |
|          |   |

|           | <b>)</b>     | · · ·      | Average of Logs<br>Scaling Factor | 0.0000<br>0.00E+00 |                 |                 |                     |
|-----------|--------------|------------|-----------------------------------|--------------------|-----------------|-----------------|---------------------|
| 03-Feb-03 | 2.809E-07    | LLD        | N/A                               |                    | 1.0000          | -1.0000         | N/A                 |
| 13-Jan-03 | 1.698E-07    | LLD        | N/A                               |                    | 1.0000          | -1.0000         | N/A                 |
| 07-Nov-02 | 1.640E-07    | LLD        | N/A                               |                    | 1.0000          | -1.0000         | N/A                 |
| 19-Oct-02 | 7.676E-07    | LLD        | N/A                               |                    | 1.0000          | -1.0000         | N/A                 |
| 12-Sep-02 | 1.745E-06    | LLD        | N/A                               |                    | 1.0000          | -1.0000         | N/A                 |
| 14-Aug-02 | 6.209E-07    | LLD        | N/A                               |                    | 1.0000          | -1.0000         | N/A                 |
| 20-Jul-02 | 1.684E-06    | LLD        | N/A                               |                    | 1.0000          | -1.0000         | N/A                 |
| Date      | Co-60 uCi/ml | DTM uCi/ml | Ratio DTM /Co-60                  | Log(DTM/Co-60)     | Log Upper range | Log Lower Range | Outlier (yes or no) |
|           |              | 1          |                                   |                    |                 |                 | 1                   |

<u>to-17-</u>4 Lutalay Prepared By Reviewed by

## DATA SHEET 1

## LIQUID RADWASTE SCALING FACTOR DETERMINATION WORKSHEET

Difficult to Measure (DTM) Radionuclide (Circle):

Sr-89

Fe-55

Sr-90

| 20-Jul-02     1.6837E-06     0     N/A     1.0000     -1.0000     N/A       14-Aug-02     6.20941E-07     LLD     N/A     1.0000     -1.0000     N/A       12-Sep-02     1.74539E-06     LLD     N/A     1.0000     -1.0000     N/A       19-Oct-02     7.67607E-07     LLD     N/A     1.0000     -1.0000     N/A       19-Oct-02     0.000000164     LLD     N/A     1.0000     -1.0000     N/A       13-Jan-03     1.698E-07     LLD     N/A     1.0000     -1.0000     N/A | Date      | Co-60 uCi/ml | DTM uCi/ml | Ratio DTM /Co-60 | Log(DTM/Co-60) | Log Upper range | Log Lower Range | Outlier (yes or no) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|------------|------------------|----------------|-----------------|-----------------|---------------------|
| 14-Aug-02     6.20941E-07     LLD     N/A     1.0000     -1.0000     N/A       12-Sep-02     1.74539E-06     LLD     N/A     1.0000     -1.0000     N/A       19-Oct-02     7.67607E-07     LLD     N/A     1.0000     -1.0000     N/A       7-Nov-02     0.000000164     LLD     N/A     1.0000     -1.0000     N/A       13-Jan-03     1.698E-07     LLD     N/A     1.0000     -1.0000     N/A                                                                              | 20-Jul-02 | 1.6837E-06   | 0          | N/A              |                | 1.0000          | -1.0000         | N/A                 |
| 12-Sep-02     1.74539E-06     LLD     N/A     1.0000     -1.0000     N/A       19-Oct-02     7.67607E-07     LLD     N/A     1.0000     -1.0000     N/A       7-Nov-02     0.000000164     LLD     N/A     1.0000     -1.0000     N/A       13-Jan-03     1.698E-07     LLD     N/A     1.0000     -1.0000     N/A                                                                                                                                                             | 14-Aug-02 | 6.20941E-07  | LLD        | N/A              |                | 1.0000          | -1.0000         | N/A                 |
| 19-Oct-02     7.67607E-07     LLD     N/A     1.0000     -1.0000     N/A       7-Nov-02     0.00000164     LLD     N/A     1.0000     -1.0000     N/A       13-Jan-03     1.698E-07     LLD     N/A     1.0000     -1.0000     N/A                                                                                                                                                                                                                                             | 12-Sep-02 | 1.74539E-06  | LLD        | N/A              |                | 1.0000          | -1.0000         | N/A                 |
| 7-Nov-02     0.000000164     LLD     N/A     1.0000     -1.0000     N/A       13-Jan-03     1.698E-07     LLD     N/A     1.0000     -1.0000     N/A                                                                                                                                                                                                                                                                                                                           | 19-Oct-02 | 7.67607E-07  | LLD        | N/A              |                | 1.0000          | -1.0000         | N/A                 |
| 13-Jan-03 1.698E-07 LLD N/A 1.0000 -1.0000 N/A                                                                                                                                                                                                                                                                                                                                                                                                                                 | 7-Nov-02  | 0.000000164  | LLD        | N/A              |                | 1.0000          | -1.0000         | N/A                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 13-Jan-03 | 1.698E-07    | LLD        | N/A              |                | 1.0000          | -1.0000         | N/A                 |
| 3-FeD-03 2.8086E-07 LLD N/A 1.0000 -1.0000 N/A                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3-Feb-03  | 2.8086E-07   | LLD        | N/A              |                | 1.0000          | -1.0000         | N/A                 |

| Average of Logs | 0.0000 |  |
|-----------------|--------|--|
| Scaling Factor  | 0      |  |

6-17-04 Prepared By

6/17/04 Reviewed By: