

J. Noggle (RL)

From: "Sandike, Steven" <SSandik@entergy.com>
To: "Mayer, Don" <DMayer1@entergy.com>, "jdn@nrc.gov" <jdn@nrc.gov>
Date: 3/21/06 5:04PM
Subject: IPEC GW&SW Dose-3-21-6.doc, Dose CoverSheet.doc

Don.... Update incorporated into report, but no reviews yet.
Dan Wilson and Ron Lavera will help me review.
But I think this is ready for you.

We will need to re-do the cover sheet (me, dan, you).

Jim.... Previous rev of attached was finalized, made into PDF, signed,
(see draft cover sheet), and nearly sent to Fred Dacimo when
we got the word regarding Nickel in MW-37.

Our new source term inputs are on Table 6, and show
that the 2005 dose from these pathways is still
less than 0.1 % of our limits.

See Table 1 summary.
We will get you the formal version soon.

Additionally, the letter from Lic on the docket will be sent to you
as soon as we incorporate these changes in the abbreviated dose
summary therein (which is of course a separate work from the Lic
department, covering more than just the dose assessment, eg
commitments, etc).

Please remember that the attached dose assessment is still
(again) in draft mode and not intended for the docket.

<<IPEC GW&SW Dose-3-21-6.doc>> <<Dose CoverSheet.doc>>

CC: "Lavera, Ron" <RLavera@entergy.com>, "Axelson, William L"
<WAxelso@entergy.com>, "Croulet, Donald" <dcroule@entergy.com>

B-3

IPEC Water Mass Balance and Dose Assessment from Groundwater and Storm Water

Table 1

Total IPEC Summary for Ground Water releases in 2005 (H-3, Ni-63, Sr-90)

Sum of two monitoring well calculations, IP2 and IP3, Areas 2 and 3

Doses, in mrem								
ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GUT	DCI
H-3	0.00E+00	1.52E-05	1.52E-05	1.52E-05	1.52E-05	1.52E-05	1.52E-05	1.36E+06
Ni-63	1.32E-03	9.17E-05	4.44E-05	0.00E+00	0.00E+00	0.00E+00	1.91E-05	6.70E+02
Sr-90	8.40E-03	0.00E+00	2.06E-03	0.00E+00	0.00E+00	0.00E+00	2.42E-04	3.35E+02
totals	9.72E-03	1.07E-04	2.12E-03	1.50E-05	1.50E-05	1.50E-05	2.76E-04	1.36E+06

Storm Drain Water from Zone B, East/West Unit 2, near MH-2, going to river directly

Doses, in mrem								
ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GUT	DCI
H-3	0.00E+00	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.46E+04

Storm Drain Water from Zones C and D/E (Central U2 & U1/U3) to Discharge Canal

Doses, in mrem								
ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GUT	DCI
H-3	0.00E+00	2.82E-08	2.82E-08	2.82E-08	2.82E-08	2.82E-08	2.82E-08	1.58E+05

Totals:

Doses, in mrem								
H-3 only	0.00E+00	1.54E-05	1.54E-05	1.54E-05	1.54E-05	1.54E-05	1.54E-05	1.53E+06
H-3, Ni-63, Sr-90	9.72E-03	1.07E-04	2.12E-03	1.54E-05	1.54E-05	1.54E-05	2.76E-04	1.36E+06

% Annual Limit	0.097	0.001	0.071	0.000	0.000	0.000	0.003
----------------	-------	-------	-------	-------	-------	-------	-------

	BONE	dose	TOT BODY	
IPEC Routine Effluents	1.70E-03	mrem	1.26E-03	<div> <p>Comparing the assessed groundwater and storm water pathways (with very conservative source terms), versus the total routine liquid effluent for the site in 2005. While still well below the limit, these GW/SD pathways indicate they can be as much as 5 times more significant than the routine effluent.</p> </div>
GW/Storm Drains	9.72E-03	mrem	2.12E-03	
Total Site Liq Dose	1.14E-02	mrem	3.38E-03	
Percent Limit	0.11%		0.11%	
GW/SD % of total	85%		63%	

IPEC Water Mass Balance and Dose Assessment from Groundwater and Storm Water

Table 2

Storm Drain Zone B (MH-2 East & West Unit 2) to the Hudson River directly, 2005

Release Rate **6.15E+07** ml/day or 1.62E+04 gpd or 11.28 gpm

Duration of Release, in days **.365** Waste vol released = 5.93E+06 gal

Dilution flow **1.11E+05** gpm Dilution vol released = 5.83E+10 gal

Dil Factor 1.02E-04 (dilution data per IP-CHM-05-042 from Dr. John Hamawi)

	Activity	10CFR20	PRE	POST	POST	MICRO-
ISOTOPE	Released	EC*10	DILUTION	DILUTION	DILUTION	CURIES
	uCi/ml	conc limit	CONC/MPC	uCi/ml	CONC/MPC	RELEASED
H-3	6.51E-07	1.00E-02	6.51E-05	6.62E-11	6.62E-09	1.46E+04
MN-54		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58		2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60		3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90		5.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134		9.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137		1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57		6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	6.51E-07	n/a	6.51E-05	6.62E-11	6.62E-09	1.46E+04

NUREG 0133 "Applicable Factor" for Near Field Dilution =

1.00E+00

Adult Total Body mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07
MN-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07

Table 3

**Central Unit 2 Storm Drain Releases of Tritium to the Hudson River
via the Discharge Canal in 2005 (Zone C)**

Release Rate **3.23E+07** ml/day or 8.54E+03 gpd or 5.93 gpm

Duration of Release, in days **365** Waste vol released = 3.12E+06 gal

Dilution flow **1.39E+06** gpm Dilution vol released = 7.31E+11 gal

Dil Factor 4.27E-06 (dilution from actual 2005 data)

	Activity	10CFR20	PRE	POST	POST	MICRO-
ISOTOPE	Released	EC*10	DILUTION	DILUTION	DILUTION	CURIES
	uCi/ml	conc limit	CONC/MPC	uCi/ml	CONC/MPC	RELEASED
H-3 *	2.90E-06	1.00E-02	2.90E-04	1.24E-11	1.24E-09	3.42E+04
MN-54		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58		2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60		3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90		5.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134		9.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137		1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57		6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	2.90E-06	n/a	2.90E-04	1.24E-11	1.24E-09	3.42E+04

* No gamma identified in storm drains, and 2.9E-6 was avg effluent H-3 in 2005 from MH-4a.

NUREG 0133 "Applicable Factor" for Near Field Dilution =

5.00E+00

Adult Total Body mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GILLI
H-3	0.00E+00	6.11E-09	6.11E-09	6.11E-09	6.11E-09	6.11E-09	6.11E-09
MN-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	6.11E-09	6.11E-09	6.11E-09	6.11E-09	6.11E-09	6.11E-09

Table 4

**Storm Drain Releases of Tritium to the Hudson River via the
Discharge Canal in 2005 from Units 1 and 3 (Zones D and E)**

Release Rate **2.17E+08** ml/day or 5.72E+04 gpd or 39.75 gpm

Duration of Release, in days **365** Waste vol released = 2.09E+07 gal

Dilution flow **1.39E+06** gpm Dilution vol released = 7.31E+11 gal

Dil Factor 2.86E-05 (dilution from actual 2005 data)

	Activity	10CFR20	PRE	POST	POST	MICRO-
ISOTOPE	Released	EC*10	DILUTION	DILUTION	DILUTION	CURIES
	uCi/ml	conc limit	CONC/MPC	uCi/ml	CONC/MPC	RELEASED
H-3 *	1.56E-06	1.00E-02	1.56E-04	4.46E-11	4.46E-09	1.23E+05
MN-54		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58		2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60		3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90		5.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134		9.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137		1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57		6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	1.56E-06	n/a	1.56E-04	4.46E-11	4.46E-09	1.23E+05

* No gamma identified in storm drains, and 1.56E-6 was average of effected Storm Drains in 2005

NUREG 0133 "Applicable Factor" for Near Field Dilution =

6.00E+00

Adult Total Body mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GILLI
H-3	0.00E+00	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08
MN-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08	2.20E-08

Table 5

IP3 Tritium Released to Hudson River via Bedrock Pathway in 2005
 (from the area near IP3 waterfront, as determined by samples from Monitoring Wells - Area 3)

Release Rate **7.53E+07** ml/day or 1.99E+04 gpd or 13.81 gpm

Duration of Release, in days **365** Waste vol released = 7.26E+06 gal

Dilution flow **1.11E+05** gpm Dilution vol released = 5.83E+10 gal

Dil Factor 1.24E-04 (dilution data per **IP-CHM-05-042** from Dr. John Hamawi)

	Activity	10CFR20	PRE	POST	POST	MICRO-
ISOTOPE	Released	EC*10	DILUTION	DILUTION	DILUTION	CURIES
	uCi/ml	conc limit	CONC/MPC	uCi/ml	CONC/MPC	RELEASED
H-3	6.20E-07	1.00E-02	6.20E-05	7.71E-11	7.71E-09	1.70E+04
MN-54		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58		2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60		3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90		5.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134		9.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137		1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57		6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	6.20E-07	n/a	6.20E-05	7.71E-11	7.71E-09	1.70E+04

NUREG 0133 "Applicable Factor" for Near Field Dilution =

1.00E+00

Adult Total Body mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GILLI
H-3	0.00E+00	1.91E-07	1.91E-07	1.91E-07	1.91E-07	1.91E-07	1.91E-07
MN-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SR-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	1.91E-07	1.91E-07	1.91E-07	1.91E-07	1.91E-07	1.91E-07

IPEC Water Mass Balance and Dose Assessment from Groundwater and Storm Water

Table 6

IP2 Activity Released to Hudson River via Bedrock Pathway, 2005 (from the area near IP2 transformer yard, as determined by samples from Monitoring Wells - Area 2)

Release Rate **1.84E+07** ml/day or 4.85E+03 gpd or 3.37 gpm

Duration of Release, in days **365** Waste vol released = 1.77E+06 gal

Dilution flow **1.11E+05** gpm Dilution vol released = 5.83E+10 gal

Dil Factor 3.03E-05 (dilution data per IP-CHM-05-042 from Dr. John Hamawi)

	Activity	10CFR20	PRE	POST	POST	MICRO-
ISOTOPE	Released	EC*10	DILUTION	DILUTION	DILUTION	CURIES
	uCi/ml	conc limit	CONC/MPC	uCi/ml	CONC/MPC	RELEASED
H-3	2.00E-04	1.00E-02	2.00E-02	6.07E-09	6.07E-07	1.34E+06
MN-54		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55		1.00E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58		2.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60		3.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	1.00E-07	1.00E-03	1.00E-04	3.03E-12	3.03E-09	6.70E+02
SR-90	5.00E-08	5.00E-06	1.00E-02	1.52E-12	3.03E-07	3.35E+02
SB-125		3.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134		9.00E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137		1.00E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57		6.00E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	2.00E-04	n/a	3.01E-02	6.07E-09	9.13E-07	1.34E+06

NUREG 0133 "Applicable Factor" for Near Field Dilution =

1.00E+00

Adult Total Body mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.50E-05	1.50E-05	1.50E-05	1.50E-05	1.50E-05	1.50E-05
MN-54	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	1.32E-03	9.17E-05	4.44E-05	0.00E+00	0.00E+00	0.00E+00	1.91E-05
SR-90	8.40E-03	0.00E+00	2.06E-03	0.00E+00	0.00E+00	0.00E+00	2.42E-04
SB-125	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-57	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	9.72E-03	1.07E-04	2.12E-03	1.50E-05	1.50E-05	1.50E-05	2.76E-04

Figure 3

