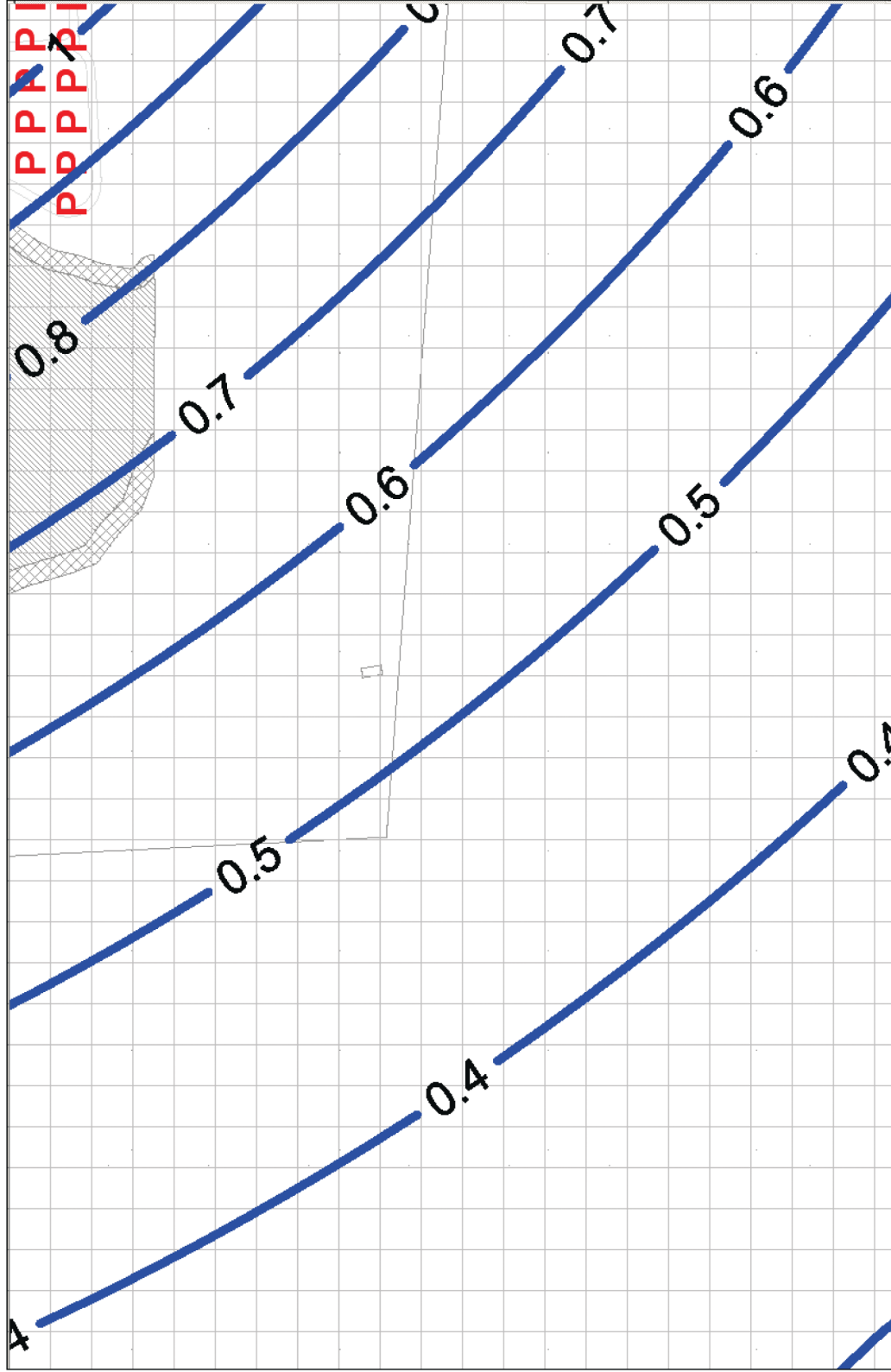


Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

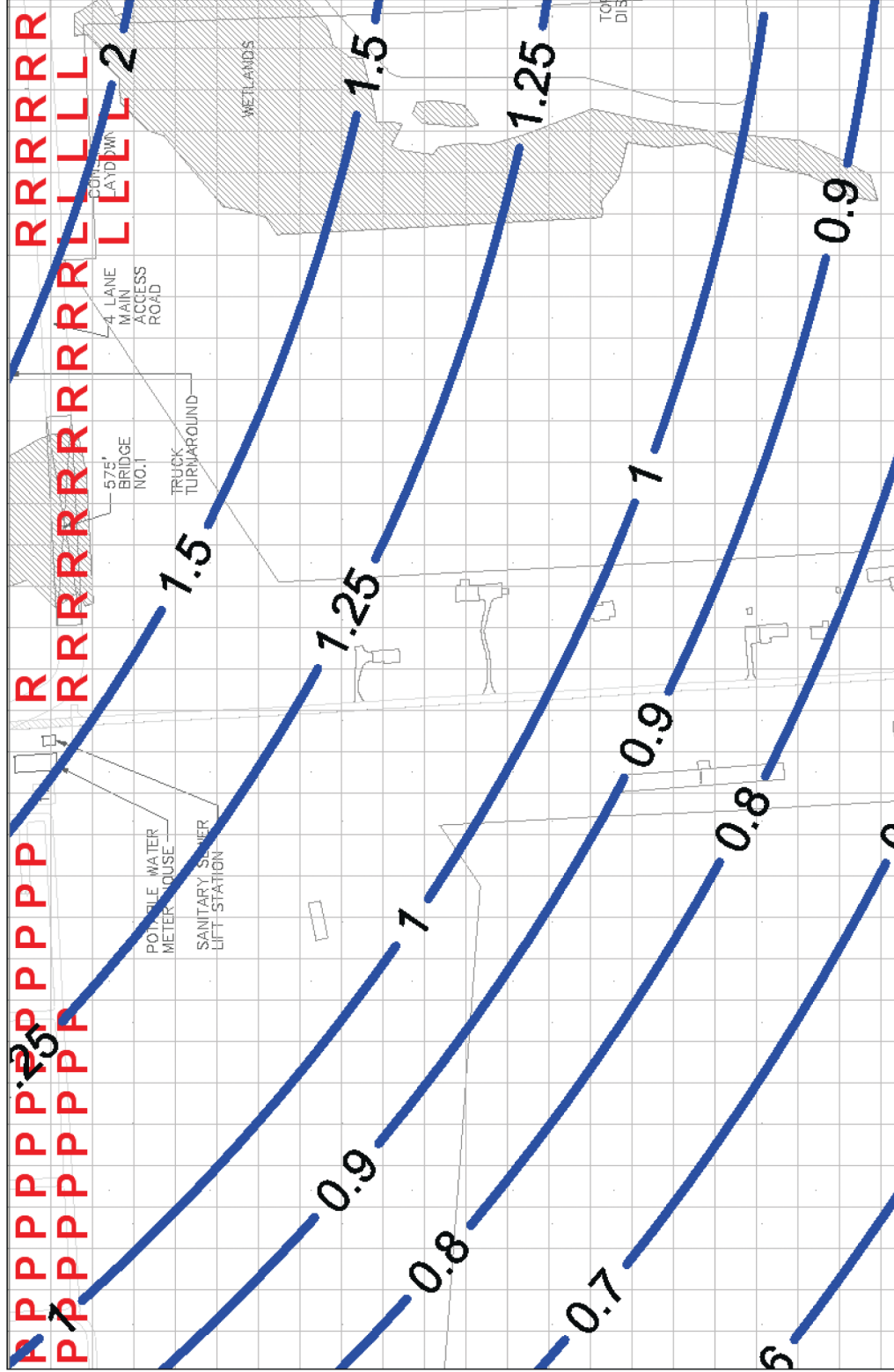
Figure 6-2: 2017 Dose Rates*
(Page 16 of 19)



*This figure is for illustration only. Any illegible information is not pertinent. Dose rates are in mrem/year.

Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

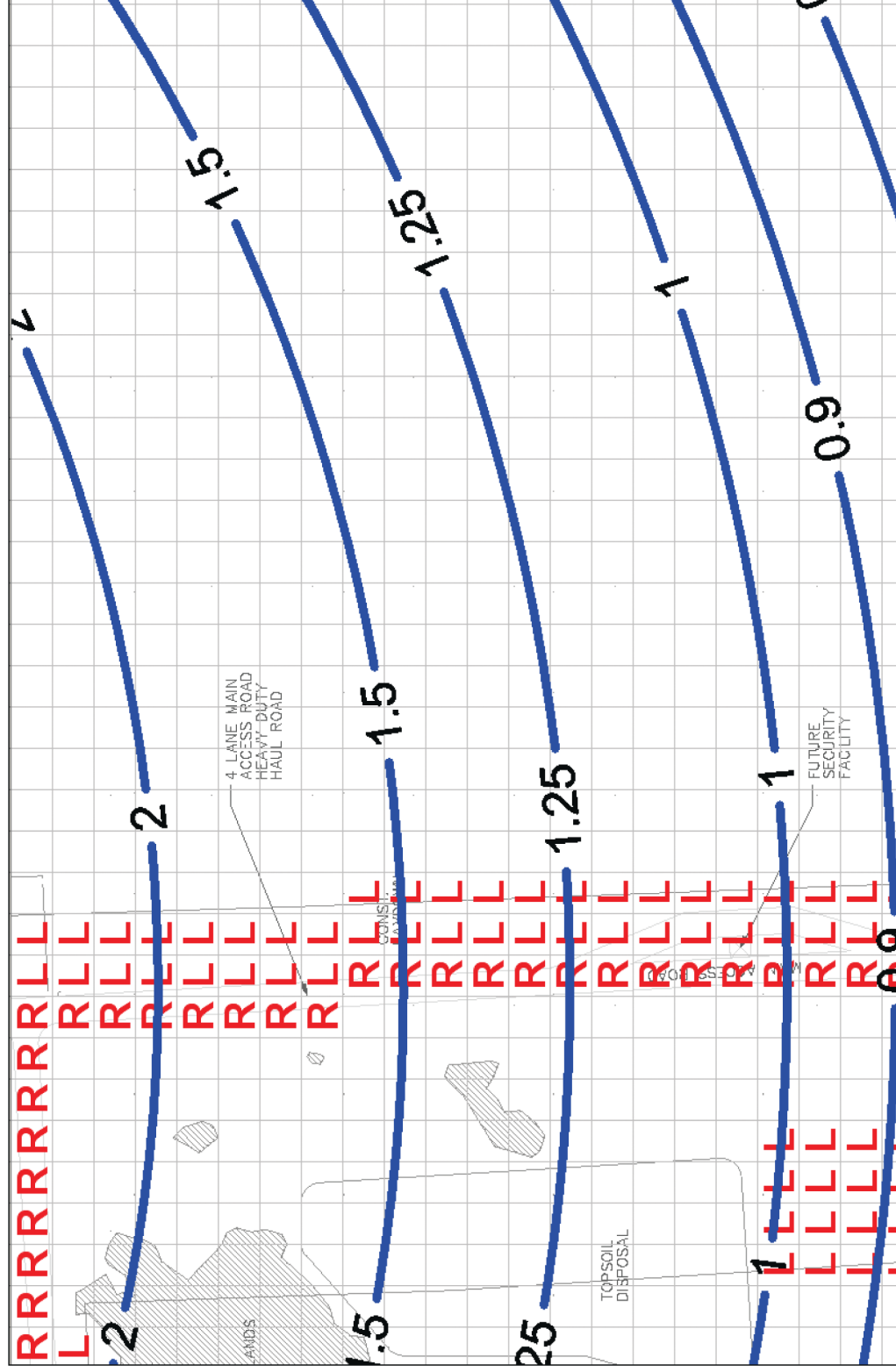
Figure 6-2: 2017 Dose Rates*
(Page 17 of 19)



*This figure is for illustration only. Any illegible information is not pertinent. Dose rates are in mrem/year.

Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

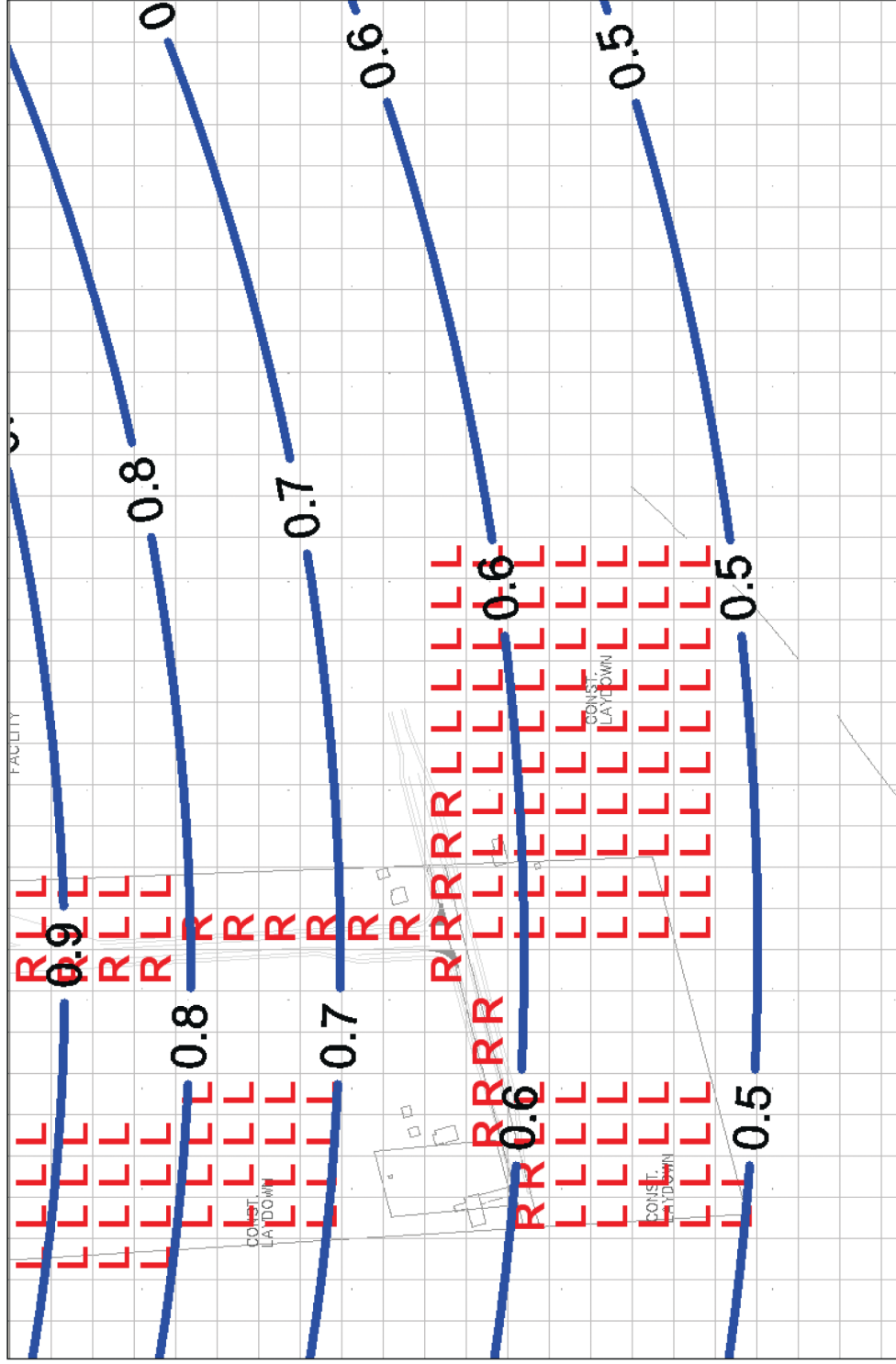
Figure 6-2: 2017 Dose Rates*
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*This figure is for illustration only. Any illegible information is not pertinent. Dose rates are in mrem/year.

Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Figure 6-2: 2017 Dose Rates*
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*This figure is for illustration only. Any illegible information is not pertinent. Dose rates are in mrem/year.



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Table 6-1: Average TEDE Dose Rates by Zone (mrem/yr (8760 hr/yr))

Zone	Count	2012	2013	2014	2015	2016	2017
B	40	4.924	4.926	4.927	4.929	4.930	4.932
C	133	1.129	1.130	1.130	1.130	1.130	1.130
L	840	2.471	2.529	2.586	2.643	2.700	2.758
O	32	1.158	1.158	1.158	1.158	1.158	1.159
P	164	1.382	1.382	1.382	1.383	1.383	1.383
R	608	2.922	3.019	3.116	3.214	3.311	3.409
S	11	2.854	2.854	2.854	2.854	2.854	2.854
T	53	1.227	1.227	1.228	1.228	1.228	1.229
W	25	2.637	2.638	2.639	2.640	2.641	2.643

Table 6-2: Number of Workers by Zone

Zone	Count	2012	2013	2014	2015	2016	2017
B	40	0.5	2.3	4.0	4.0	4.0	3.2
C	133	353.1	1516.9	2660.0	2660.0	2660.0	2138.0
L	840	10.6	45.6	80.0	80.0	80.0	64.3
O	32	85.0	365.0	640.0	640.0	640.0	514.4
P	164	10.6	45.6	80.0	80.0	80.0	64.3
R	608	10.6	45.6	80.0	80.0	80.0	64.3
S	11	35.0	150.5	264.0	264.0	264.0	212.2
T	53	35.0	150.5	264.0	264.0	264.0	212.2
W	25	1.6	6.8	12.0	12.0	12.0	9.6
	By YEAR	542.2	2328.9	4084.0	4084.0	4084.0	3282.5

Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Table 6-3: Collective Dose by Zone Assuming 2200 Hours Occupancy (person-rem)

Zone Description	2012	2013	2014	2015	2016	2017	By ZONE
Batch Plant	0.001	0.003	0.005	0.005	0.005	0.004	0.022
Construction on main structures	0.100	0.430	0.755	0.755	0.755	0.607	3.402
Laydown	0.007	0.029	0.052	0.053	0.054	0.045	0.239
Office/Trailer	0.025	0.106	0.186	0.186	0.186	0.150	0.839
Parking	0.004	0.016	0.028	0.028	0.028	0.022	0.125
Roads	0.008	0.035	0.063	0.065	0.067	0.055	0.291
Shoreline, tunnel, barge, in/out flow	0.025	0.108	0.189	0.189	0.189	0.152	0.853
Tower/Basin	0.011	0.046	0.081	0.081	0.081	0.065	0.367
Warehouse/Shops	0.001	0.005	0.008	0.008	0.008	0.006	0.036
By YEAR -->	0.181	0.778	1.367	1.370	1.373	1.106	6.175

6.1 Dose Compliance with 10 CFR 20.1301

10 CFR 20.1301 [Reference 3] limits annual doses from licensed operations to individual members of the public to 1 mSv (100 mrem) total effective dose equivalent (TEDE). In addition, the dose from external sources to unrestricted areas must be less than 0.02 mSv (0.002 rem) in any one hour. This applies to the public both outside of and within the controlled area. Given that the relevant sources are relatively constant in time, the hourly limit is met if the annual limit is met.

Dose rates in each 99 ft (30 m) by 97 ft (30 m) block of the plant grid are calculated and the array of dose rates searched for the maximum in the construction zones. The maximum annual doses by zone are summarized in Table 6-4. For an occupational year, i.e., 2200 hours on site, the maximum dose would occur at Confers Lane west of SSES Unit 1 Cooling Tower where the dose is 162 μ Sv (16 mrem). This assumes the worker stood on Confers Lane for all working hours in one year. This is less than 1 mSv (100 mrem), thus, it meets the criterion and therefore construction workers can be considered to be members of the general public, for the purpose of radiation protection.

Table 6-4: Maximum Annual Construction Zone Doses Assuming 2200 Hours Occupancy – All Sources

Zone	Zone Description	Dose Rate mrem/2200 hours
B	Batch Plant	1.58
C	Construction on main structures	0.37
L	Laydown	7.45
O	Office/Trailer	1.06
P	Parking	0.67
R	Roads	16.24
S	Shoreline, tunnel, barge, in/out flow	0.74
T	Tower/Basin	0.38
W	Warehouse/Shops	0.93



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

6.2 Dose Compliance with 10 CFR 50, Appendix I

The 10 CFR 50, Appendix I [Reference 4] criteria apply only to effluents. The purpose of the criteria is to assure adequate design of effluent controls. The annual limits for liquid effluents are 3 mrem (30 μ Sv) to the total body and 10 mrem (100 μ Sv) to any organ. For gaseous effluents, the pertinent limits are 5 mrem (50 μ Sv) to total body and 15 mrem (150 μ Sv) to organs including skin. Table 6-5 shows that there is no dose rate to a construction worker that exceeds the limits. Therefore, the criteria have been met. Note that BBNPP occupational zones are treated, for purposes of these criteria, as unrestricted areas.

Table 6-5: Maximum Dose Rates by Zone – Effluents Only

Zone	Zone Description	Gaseous Effluent Total Body Dose (mrem/yr)	Gaseous Effluent Organ Dose (mrem/yr)	Liquid Effluent Dose (mrem/yr)
B	Batch Plant	2.21	2.30	0.00
C	Construction on main structures	0.40	0.42	0.00
L	Laydown	1.38	1.44	0.00
O	Office/Trailer	1.43	1.49	0.00
P	Parking	0.67	0.70	0.00
R	Roads	2.50	2.61	0.00
S	Shoreline, tunnel, barge, in/out flow	0.54	0.57	1.62
T	Tower/Basin	0.41	0.43	0.00
W	Warehouse/Shops	0.96	1.00	0.00

6.3 Dose Compliance with 40 CFR 190

The 40 CFR 190 [Reference 5] criteria refer to annual doses. Here they are called dose rates because the units are in mrem per year received by members of the general public exposed to nuclear fuel cycle operations, i.e., nuclear power plants. Therefore, these regulations apply to Bell Bend construction workers on the plant site just as they apply to members of the general public who live off-site. The most limiting part of the regulation states "The annual dose equivalent (shall) not exceed 25 mrem (per year) to the whole body." In the case of Susquehanna/Bell Bend, if this regulation for TEDE whole body is met, then the whole body, thyroid, and organ dose regulations will be met (i.e., the TEDE dose is more conservative than the 40 CFR 190 dose since its dose type coefficient from Table 2-2 is greater).

Table 6-4 shows that the maximum dose rates for construction zones other than roads are all less than 250 μ Sv/year (25 mrem/year). The maximum dose rate in roads is 162 μ Sv (16 mrem) per 2200 hours. The units are so expressed to be clear that an occupancy of 2200 hours is assumed. For a worker with two weeks vacation and 10% overtime, this is equivalent to 162 μ Sv/year (16 mrem/year).

6.4 Collective Doses to Unit 3 Workers

The collective dose is the sum of all doses received by all workers. It is a measure of population risk. The total worker collective dose for the combined years of construction is 6.18E-02 person-Sieverts (6.18 person-rem). This is a best estimate based upon the worker census and occupancy projections shown in Table 4-2 and Table 4-3. The breakdown of collective dose by construction year and occupancy zone is given in Table 6-3. This assumes 2200 hours per year occupancy for each worker.



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

6.5 Spreadsheet Manipulations

The spreadsheet uses multiple worksheets, each of which is described below.

6.5.1 Use Codes on Map Worksheet

The Use Codes on Map worksheet contains a usage grid overlaid on a site map, a sample of which is shown in Figure 6-1. No calculations are performed on this worksheet.

6.5.2 Input Worksheet

This worksheet includes inputs detailed in Section 2.0 and Section 4.0.

6.5.3 Dose Rate Worksheet

This worksheet calculates the dose rate for each square on the plant grid. An explanation of each column is given in Table 6-6.

Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Table 6-6: Explanation of Dose Rate Worksheet of Spreadsheet

Column	Contents																								
A	Index, assigned to the grid square in numerical order starting with the top left square.																								
B	X index, where 0 is the leftmost square and numbers get larger to the right																								
C	Y index, where 0 is the uppermost square and numbers get larger going down																								
D	North-South coordinate of the square center point based upon the coordinate of the upper left corner of the grid, which is N 346000 ft, in feet $= 346000 \text{ ft} - (49.4 \text{ ft} * \text{Column B}) - \frac{49.4 \text{ ft}}{2}$																								
E	East-West coordinate of the square center point based upon the coordinate of the upper left corner of the grid, which is E 2446100 ft, in feet $= 2446100 \text{ ft} + (48.33 \text{ ft} * \text{Column C}) + \frac{48.33 \text{ ft}}{2}$																								
F	Usage code using the following <table><tr><th>Zone Description</th><th>Zone Code</th><th>Zone Description</th><th>Zone Code</th><th>Zone Description</th><th>Zone Code</th></tr><tr><td>Batch Plant</td><td>B</td><td>Office/Trailer</td><td>O</td><td>Shoreline</td><td>S</td></tr><tr><td>Construction on main structures</td><td>C</td><td>Parking</td><td>P</td><td>Tower/Basin</td><td>T</td></tr><tr><td>Laydown</td><td>L</td><td>Roads</td><td>R</td><td>Warehouse/Shops</td><td>W</td></tr></table> <p>The spatial distribution of the zones on the site is shown (red letters indicating a zone code in each square; sample shown in Figure 6-1). There are many locations where construction workers are not expected to be, so they are not marked in the figure. These squares that are marked are chosen because of planned activities at those locations.</p>	Zone Description	Zone Code	Zone Description	Zone Code	Zone Description	Zone Code	Batch Plant	B	Office/Trailer	O	Shoreline	S	Construction on main structures	C	Parking	P	Tower/Basin	T	Laydown	L	Roads	R	Warehouse/Shops	W
Zone Description	Zone Code	Zone Description	Zone Code	Zone Description	Zone Code																				
Batch Plant	B	Office/Trailer	O	Shoreline	S																				
Construction on main structures	C	Parking	P	Tower/Basin	T																				
Laydown	L	Roads	R	Warehouse/Shops	W																				
G	Distance to Gas in feet* $= \sqrt{(\text{Column D} - 341175)^2 + (\text{Column E} - 2442100)^2}$																								
H	Distance from square to north half of ISFSI in feet $= \sqrt{(\text{Column D} - 341550)^2 + (\text{Column E} - 2240600)^2}$																								

* Coordinates for the gaseous effluent release point are the common release point identified in Reference 14, Section 2.1.1.2

Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Column	Contents
I	Distance from square to south half of ISFSI in feet $= \sqrt{(\text{Column D} - 341450)^2 + (\text{Column E} - 2240600)^2}$
J	Distance from square to LLRWHF in feet $= \sqrt{(\text{Column D} - 341400)^2 + (\text{Column E} - 2440500)^2}$
K	Distance from square to SEALAND containers in feet $= \sqrt{(\text{Column D} - 340750)^2 + (\text{Column E} - 2441050)^2}$
L	Distance from square to Seam Dryer Storage Vault in feet $= \sqrt{(\text{Column D} - 341060.3)^2 + (\text{Column E} - 2440653.5)^2}$
M	Distance from square to turbine building in feet $= \sqrt{(\text{Column D} - 341175)^2 + (\text{Column E} - 2441833)^2}$
N	Distance from square to Condensate Storage Tanks $= \sqrt{(\text{Column D} - 341371)^2 + (\text{Column E} - 2442007.5)^2}$
O	Solid angle between the square and the north half of the ISFSI in Steradians $= \pi \left(1 - \frac{\text{Column H}}{\sqrt{(116.52 \text{ ft})^2 + (\text{Column H})^2}} \right)$
P	Solid angle between the square and the south half of the ISFSI in Steradians $= \pi \left(1 - \frac{\text{Column I}}{\sqrt{(116.52 \text{ ft})^2 + (\text{Column I})^2}} \right)$
Q	Annual dose rate from liquid effluents in mrem/yr = 1.62 if usage (column F) is 'S', otherwise 0

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Column	Contents
R	Annual TEDE dose rate from gaseous effluents in mrem/yr = $1259244 * (\text{Column G})^{-1.6925}$
S	Annual 10 CFR 50, Appendix I total body dose from gaseous effluents in mrem/yr = $692594.5 * (\text{Column G})^{-1.6925}$
T	Annual 10 CFR 50, Appendix I dose to the organs from gaseous effluents in mrem/yr = $721931 * (\text{Column G})^{-1.6925}$
U	Annual dose rate from the Condensate Storage Tanks in mrem/yr = $2\text{E} - 05\text{e}^{-0.0018 * \text{Column N}}$
V	Annual dose rate from the LLRWHF in mrem/yr = $15068653 * (\text{Column J})^{-2.3}$
W	Annual dose rate from the SEALAND containers in mrem/yr = $5.7055\text{e}^{-0.0006 * \text{Column K}}$
X	Annual dose rate from the Steam Dryer Storage Vault = $14.37\text{e}^{-0.003 * \text{Column L}}$
Y	Annual dose rate from the Turbine Building = $0.8744\text{e}^{-0.0009 * \text{Column M}}$
Z	2012 dose from the ISFSI in mrem = $1500 [(-233.88 + 0.177 * 2012)(\text{Column O})(\text{e}^{-0.002056 * \text{Column H}}) + (-253.79 + 0.126 * 2012)(\text{Column P})(\text{e}^{-0.002056 * \text{Column I}})]$
AA	2013 dose from the ISFSI in mrem = $1500 [(-233.88 + 0.177 * 2013)(\text{Column O})(\text{e}^{-0.002056 * \text{Column H}}) + (-253.79 + 0.126 * 2013)(\text{Column P})(\text{e}^{-0.002056 * \text{Column I}})]$
AB	2014 dose from the ISFSI in mrem = $1500 [(-233.88 + 0.177 * 2014)(\text{Column O})(\text{e}^{-0.002056 * \text{Column H}}) + (-253.79 + 0.126 * 2014)(\text{Column P})(\text{e}^{-0.002056 * \text{Column I}})]$

Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Column	Contents
AC	2015 dose from the ISFSI in mrem $= 1500 [(-233.88 + 0.177 * 2015)(\text{Column O})(e^{-0.002056 * \text{Column H}}) + (-253.79 + 0.126 * 2015)(\text{Column P})(e^{-0.002056 * \text{Column I}})]$
AD	2016 dose from the ISFSI in mrem $= 1500 [(-233.88 + 0.177 * 2016)(\text{Column O})(e^{-0.002056 * \text{Column H}}) + (-253.79 + 0.126 * 2016)(\text{Column P})(e^{-0.002056 * \text{Column I}})]$
AE	2017 dose from the ISFSI in mrem $= 1500 [(-233.88 + 0.177 * 2017)(\text{Column O})(e^{-0.002056 * \text{Column H}}) + (-253.79 + 0.126 * 2017)(\text{Column P})(e^{-0.002056 * \text{Column I}})]$
AF	Total TEDE dose rate for the year 2012 in mrem (for 100% occupancy) = Column Q + Column R + Column U + Column V + Column W + Column X + Column Y + Column Z
AG	Total TEDE dose rate for the year 2013 in mrem (for 100% occupancy) = Column Q + Column R + Column U + Column V + Column W + Column X + Column Y + Column AA
AH	Total TEDE dose rate for the year 2014 in mrem (for 100% occupancy) = Column Q + Column R + Column U + Column V + Column W + Column X + Column Y + Column AB
AI	Total TEDE dose rate for the year 2015 in mrem (for 100% occupancy) = Column Q + Column R + Column U + Column V + Column W + Column X + Column Y + Column AC
AJ	Total TEDE dose rate for the year 2016 in mrem (for 100% occupancy) = Column Q + Column R + Column U + Column V + Column W + Column X + Column Y + Column AD
AK	Total TEDE dose rate for the year 2017 in mrem (for 100% occupancy) = Column Q + Column R + Column U + Column V + Column W + Column X + Column Y + Column AE



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

6.5.4 Dose Worksheet

The contents of this worksheet are discussed in Table 6-7.

Table 6-7: Explanation of Dose Worksheet of Spreadsheet

Cell(s)	Contents
A3 through A11	Zone Code
B3 through B11	Zone Description
C3 through C11	Zone Area, counts the number of grid squares designated as the zone shown in Column A
D3 through D11	Occupancy Fraction from input worksheet
E3	2012 worker population in zone B by year = $D3 * (\text{input worksheet cell C74})/C3$
E4	2012 worker population in zone C by year = $D4 * (\text{input worksheet cell C74})/C4$
E5	2012 worker population in zone L by year = $D5 * (\text{input worksheet cell C74})/C5$
E6	2012 worker population in zone O by year = $D6 * (\text{input worksheet cell C74})/C6$
E7	2012 worker population in zone P by year = $D7 * (\text{input worksheet cell C74})/C7$
E8	2012 worker population in zone R by year = $D8 * (\text{input worksheet cell C74})/C8$
E9	2012 worker population in zone S by year = $D9 * (\text{input worksheet cell C74})/C9$
E10	2012 worker population in zone T by year = $D10 * (\text{input worksheet cell C74})/C10$
E11	2012 worker population in zone W by year = $D11 * (\text{input worksheet cell C74})/C11$
F3	2013 worker population in zone B by year = $D3 * (\text{input worksheet cell C75})/C3$
F4	2013 worker population in zone C by year = $D4 * (\text{input worksheet cell C75})/C4$
F5	2013 worker population in zone L by year = $D5 * (\text{input worksheet cell C75})/C5$
F6	2013 worker population in zone O by year = $D6 * (\text{input worksheet cell C75})/C6$
F7	2013 worker population in zone P by year = $D7 * (\text{input worksheet cell C75})/C7$
F8	2013 worker population in zone R by year = $D8 * (\text{input worksheet cell C75})/C8$
F9	2013 worker population in zone S by year = $D9 * (\text{input worksheet cell C75})/C9$
F10	2013 worker population in zone T by year = $D10 * (\text{input worksheet cell C75})/C10$
F11	2013 worker population in zone W by year = $D11 * (\text{input worksheet cell C75})/C11$



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Cell(s)	Contents
G3	2014 worker population in zone B by year = D3 * (input worksheet cell C76)/C3
G4	2014 worker population in zone C by year = D4 * (input worksheet cell C76)/C4
G5	2014 worker population in zone L by year = D5 * (input worksheet cell C76)/C5
G6	2014 worker population in zone O by year = D6 * (input worksheet cell C76)/C6
G7	2014 worker population in zone P by year = D7 * (input worksheet cell C76)/C7
G8	2014 worker population in zone R by year = D8 * (input worksheet cell C76)/C8
G9	2014 worker population in zone S by year = D9 * (input worksheet cell C76)/C9
G10	2014 worker population in zone T by year = D10 * (input worksheet cell C76)/C10
G11	2014 worker population in zone W by year = D11 * (input worksheet cell C76)/C11
H3	2015 worker population in zone B by year = D3 * (input worksheet cell C77)/C3
H4	2015 worker population in zone C by year = D4 * (input worksheet cell C77)/C4
H5	2015 worker population in zone L by year = D5 * (input worksheet cell C77)/C5
H6	2015 worker population in zone O by year = D6 * (input worksheet cell C77)/C6
H7	2015 worker population in zone P by year = D7 * (input worksheet cell C77)/C7
H8	2015 worker population in zone R by year = D8 * (input worksheet cell C77)/C8
H9	2015 worker population in zone S by year = D9 * (input worksheet cell C77)/C9
H10	2015 worker population in zone T by year = D10 * (input worksheet cell C77)/C10
H11	2015 worker population in zone W by year = D11 * (input worksheet cell C77)/C11
I3	2016 worker population in zone B by year = D3 * (input worksheet cell C78)/C3
I4	2016 worker population in zone C by year = D4 * (input worksheet cell C78)/C4
I5	2016 worker population in zone L by year = D5 * (input worksheet cell C78)/C5
I6	2016 worker population in zone O by year = D6 * (input worksheet cell C78)/C6
I7	2016 worker population in zone P by year = D7 * (input worksheet cell C78)/C7
I8	2016 worker population in zone R by year = D8 * (input worksheet cell C78)/C8
I9	2016 worker population in zone S by year = D9 * (input worksheet cell C78)/C9



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Cell(s)	Contents
I10	2016 worker population in zone T by year = D10 * (input worksheet cell C78)/C10
I11	2016 worker population in zone W by year = D11 * (input worksheet cell C78)/C11
J3	2017 worker population in zone B by year = D3 * (input worksheet cell C79)/C3
J4	2017 worker population in zone C by year = D4 * (input worksheet cell C79)/C4
J5	2017 worker population in zone L by year = D5 * (input worksheet cell C79)/C5
J6	2017 worker population in zone O by year = D6 * (input worksheet cell C79)/C6
J7	2017 worker population in zone P by year = D7 * (input worksheet cell C79)/C7
J8	2017 worker population in zone R by year = D8 * (input worksheet cell C79)/C8
J9	2017 worker population in zone S by year = D9 * (input worksheet cell C79)/C9
J10	2017 worker population in zone T by year = D10 * (input worksheet cell C79)/C10
J11	2017 worker population in zone W by year = D11 * (input worksheet cell C79)/C11
C15 through C23	Zone Code
D15 through D23	Zone Area, equivalent to C3 through C11
E15	2012 average dose rate in zone B = (Sum of cells in Dose Rate worksheet column AF that have a usage code of B)/D15
E16	2012 average dose rate in zone C = (Sum of cells in Dose Rate worksheet column AF that have a usage code of C)/D16
E17	2012 average dose rate in zone L = (Sum of cells in Dose Rate worksheet column AF that have a usage code of L)/D17
E18	2012 average dose rate in zone O = (Sum of cells in Dose Rate worksheet column AF that have a usage code of O)/D18
E19	2012 average dose rate in zone P = (Sum of cells in Dose Rate worksheet column AF that have a usage code of P)/D19
E20	2012 average dose rate in zone R = (Sum of cells in Dose Rate worksheet column AF that have a usage code of R)/D20
E21	2012 average dose rate in zone S = (Sum of cells in Dose Rate worksheet column AF that have a usage code of S)/D21
E22	2012 average dose rate in zone T = (Sum of cells in Dose Rate worksheet column AF that have a usage code of T)/D22



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Cell(s)	Contents
E23	2012 average dose rate in zone W = (Sum of cells in Dose Rate worksheet column AF that have a usage code of W)/D23
F15	2013 average dose rate in zone B = (Sum of cells in Dose Rate worksheet column AG that have a usage code of B)/D15
F16	2013 average dose rate in zone C = (Sum of cells in Dose Rate worksheet column AG that have a usage code of C)/D16
F17	2013 average dose rate in zone L = (Sum of cells in Dose Rate worksheet column AG that have a usage code of L)/D17
F18	2013 average dose rate in zone O = (Sum of cells in Dose Rate worksheet column AG that have a usage code of O)/D18
F19	2013 average dose rate in zone P = (Sum of cells in Dose Rate worksheet column AG that have a usage code of P)/D19
F20	2013 average dose rate in zone R = (Sum of cells in Dose Rate worksheet column AG that have a usage code of R)/D20
F21	2013 average dose rate in zone S = (Sum of cells in Dose Rate worksheet column AG that have a usage code of S)/D21
F22	2013 average dose rate in zone T = (Sum of cells in Dose Rate worksheet column AG that have a usage code of T)/D22
F23	2013 average dose rate in zone W = (Sum of cells in Dose Rate worksheet column AG that have a usage code of W)/D23
G15	2014 average dose rate in zone B = (Sum of cells in Dose Rate worksheet column AH that have a usage code of B)/D15
G16	2014 average dose rate in zone C = (Sum of cells in Dose Rate worksheet column AH that have a usage code of C)/D16
G17	2014 average dose rate in zone L = (Sum of cells in Dose Rate worksheet column AH that have a usage code of L)/D17
G18	2014 average dose rate in zone O = (Sum of cells in Dose Rate worksheet column AH that have a usage code of O)/D18
G19	2014 average dose rate in zone P = (Sum of cells in Dose Rate worksheet column AH that have a usage code of P)/D19
G20	2014 average dose rate in zone R = (Sum of cells in Dose Rate worksheet column AH that have a usage code of R)/D20



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
G21	2014 average dose rate in zone S = (Sum of cells in Dose Rate worksheet column AH that have a usage code of S)/D21
G22	2014 average dose rate in zone T = (Sum of cells in Dose Rate worksheet column AH that have a usage code of T)/D22
G23	2014 average dose rate in zone W = (Sum of cells in Dose Rate worksheet column AH that have a usage code of W)/D23
H15	2015 average dose rate in zone B = (Sum of cells in Dose Rate worksheet column AI that have a usage code of B)/D15
H16	2015 average dose rate in zone C = (Sum of cells in Dose Rate worksheet column AI that have a usage code of C)/D16
H17	2015 average dose rate in zone L = (Sum of cells in Dose Rate worksheet column AI that have a usage code of L)/D17
H18	2015 average dose rate in zone O = (Sum of cells in Dose Rate worksheet column AI that have a usage code of O)/D18
H19	2015 average dose rate in zone P = (Sum of cells in Dose Rate worksheet column AI that have a usage code of P)/D19
H20	2015 average dose rate in zone R = (Sum of cells in Dose Rate worksheet column AI that have a usage code of R)/D20
H21	2015 average dose rate in zone S = (Sum of cells in Dose Rate worksheet column AI that have a usage code of S)/D21
H22	2015 average dose rate in zone T = (Sum of cells in Dose Rate worksheet column AI that have a usage code of T)/D22
H23	2015 average dose rate in zone W = (Sum of cells in Dose Rate worksheet column AI that have a usage code of W)/D23
I15	2016 average dose rate in zone B = (Sum of cells in Dose Rate worksheet column AJ that have a usage code of B)/D15
I16	2016 average dose rate in zone C = (Sum of cells in Dose Rate worksheet column AJ that have a usage code of C)/D16
I17	2016 average dose rate in zone L = (Sum of cells in Dose Rate worksheet column AJ that have a usage code of L)/D17
I18	2016 average dose rate in zone O = (Sum of cells in Dose Rate worksheet column AJ that have a usage code of O)/D18



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
I19	2016 average dose rate in zone P = (Sum of cells in Dose Rate worksheet column AJ that have a usage code of P)/D19
I20	2016 average dose rate in zone R = (Sum of cells in Dose Rate worksheet column AJ that have a usage code of R)/D20
I21	2016 average dose rate in zone S = (Sum of cells in Dose Rate worksheet column AJ that have a usage code of S)/D21
I22	2016 average dose rate in zone T = (Sum of cells in Dose Rate worksheet column AJ that have a usage code of T)/D22
I23	2016 average dose rate in zone W = (Sum of cells in Dose Rate worksheet column AJ that have a usage code of W)/D23
J15	2017 average dose rate in zone B = (Sum of cells in Dose Rate worksheet column AK that have a usage code of B)/D15
J16	2017 average dose rate in zone C = (Sum of cells in Dose Rate worksheet column AK that have a usage code of C)/D16
J17	2017 average dose rate in zone L = (Sum of cells in Dose Rate worksheet column AK that have a usage code of L)/D17
J18	2017 average dose rate in zone O = (Sum of cells in Dose Rate worksheet column AK that have a usage code of O)/D18
J19	2017 average dose rate in zone P = (Sum of cells in Dose Rate worksheet column AK that have a usage code of P)/D19
J20	2017 average dose rate in zone R = (Sum of cells in Dose Rate worksheet column AK that have a usage code of R)/D20
J21	2017 average dose rate in zone S = (Sum of cells in Dose Rate worksheet column AK that have a usage code of S)/D21
J22	2017 average dose rate in zone T = (Sum of cells in Dose Rate worksheet column AK that have a usage code of T)/D22
J23	2017 average dose rate in zone W = (Sum of cells in Dose Rate worksheet column AK that have a usage code of W)/D23
C27 through C35	Zone Code
D27 through D35	Zone Area, equivalent to C3 through C11
E27	Number of workers in zone B in 2012 = D3*(Input worksheet cell C74)
E28	Number of workers in zone C in 2012 = D4*(Input worksheet cell C74)



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
E29	Number of workers in zone L in 2012 = D5*(Input worksheet cell C74)
E30	Number of workers in zone O in 2012 = D6*(Input worksheet cell C74)
E31	Number of workers in zone P in 2012 = D7*(Input worksheet cell C74)
E32	Number of workers in zone R in 2012 = D8*(Input worksheet cell C74)
E33	Number of workers in zone S in 2012 = D9*(Input worksheet cell C74)
E34	Number of workers in zone T in 2012 = D10*(Input worksheet cell C74)
E35	Number of workers in zone W in 2012 = D11*(Input worksheet cell C74)
F27	Number of workers in zone B in 2013 = D3*(Input worksheet cell C75)
F28	Number of workers in zone C in 2013 = D4*(Input worksheet cell C75)
F29	Number of workers in zone L in 2013 = D5*(Input worksheet cell C75)
F30	Number of workers in zone O in 2013 = D6*(Input worksheet cell C75)
F31	Number of workers in zone P in 2013 = D7*(Input worksheet cell C75)
F32	Number of workers in zone R in 2013 = D8*(Input worksheet cell C75)
F33	Number of workers in zone S in 2013 = D9*(Input worksheet cell C75)
F34	Number of workers in zone T in 2013 = D10*(Input worksheet cell C75)
F35	Number of workers in zone W in 2013 = D11*(Input worksheet cell C75)
G27	Number of workers in zone B in 2014 = D3*(Input worksheet cell C76)
G28	Number of workers in zone C in 2014 = D4*(Input worksheet cell C76)
G29	Number of workers in zone L in 2014 = D5*(Input worksheet cell C76)
G30	Number of workers in zone O in 2014 = D6*(Input worksheet cell C76)
G31	Number of workers in zone P in 2014 = D7*(Input worksheet cell C76)
G32	Number of workers in zone R in 2014 = D8*(Input worksheet cell C76)
G33	Number of workers in zone S in 2014 = D9*(Input worksheet cell C76)
G34	Number of workers in zone T in 2014 = D10*(Input worksheet cell C76)
G35	Number of workers in zone W in 2014 = D11*(Input worksheet cell C76)



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
H27	Number of workers in zone B in 2015 = D3*(Input worksheet cell C77)
H28	Number of workers in zone C in 2015 = D4*(Input worksheet cell C77)
H29	Number of workers in zone L in 2015 = D5*(Input worksheet cell C77)
H30	Number of workers in zone O in 2015 = D6*(Input worksheet cell C77)
H31	Number of workers in zone P in 2015 = D7*(Input worksheet cell C77)
H32	Number of workers in zone R in 2015 = D8*(Input worksheet cell C77)
H33	Number of workers in zone S in 2015 = D9*(Input worksheet cell C77)
H34	Number of workers in zone T in 2015 = D10*(Input worksheet cell C77)
H35	Number of workers in zone W in 2015 = D11*(Input worksheet cell C77)
I27	Number of workers in zone B in 2016 = D3*(Input worksheet cell C78)
I28	Number of workers in zone C in 2016 = D4*(Input worksheet cell C78)
I29	Number of workers in zone L in 2016 = D5*(Input worksheet cell C78)
I30	Number of workers in zone O in 2016 = D6*(Input worksheet cell C78)
I31	Number of workers in zone P in 2016 = D7*(Input worksheet cell C78)
I32	Number of workers in zone R in 2016 = D8*(Input worksheet cell C78)
I33	Number of workers in zone S in 2016 = D9*(Input worksheet cell C78)
I34	Number of workers in zone T in 2016 = D10*(Input worksheet cell C78)
I35	Number of workers in zone W in 2016 = D11*(Input worksheet cell C78)
J27	Number of workers in zone B in 2017 = D3*(Input worksheet cell C79)
J28	Number of workers in zone C in 2017 = D4*(Input worksheet cell C79)
J29	Number of workers in zone L in 2017 = D5*(Input worksheet cell C79)
J30	Number of workers in zone O in 2017 = D6*(Input worksheet cell C79)
J31	Number of workers in zone P in 2017 = D7*(Input worksheet cell C79)
J32	Number of workers in zone R in 2017 = D8*(Input worksheet cell C79)
J33	Number of workers in zone S in 2017 = D9*(Input worksheet cell C79)



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
J34	Number of workers in zone T in 2017 = D10*(Input worksheet cell C79)
J35	Number of workers in zone W in 2017 = D11*(Input worksheet cell C79)
E36	Total (conservative) number of workers in 2012 = E27 + E28 + E29 + E30 + E31 + E32 + E33 + E34 + E35
F36	Total (conservative) number of workers in 2013 = F27 + F28 + F29 + F30 + F31 + F32 + F33 + F34 + F35
G36	Total (conservative) number of workers in 2014 = G27 + G28 + G29 + G30 + G31 + G32 + G33 + G34 + G35
H36	Total (conservative) number of workers in 2015 = H27 + H28 + H29 + H30 + H31 + H32 + H33 + H34 + H35
I36	Total (conservative) number of workers in 2016 = I27 + I28 + I29 + I30 + I31 + I32 + I33 + I34 + I35
J36	Total (conservative) number of workers in 2017 = J27 + J28 + J29 + J30 + J31 + J32 + J33 + J34 + J35
A40 through A48	Zone Code
B40 through B48	Zone Description
C40	2012 collective dose in zone B = (2200/8760) *E15*E27/1000
C41	2012 collective dose in zone C = (2200/8760) *E16*E28/1000
C42	2012 collective dose in zone L = (2200/8760) *E17*E29/1000
C43	2012 collective dose in zone O = (2200/8760) *E18*E30/1000
C44	2012 collective dose in zone P = (2200/8760) *E19*E31/1000
C45	2012 collective dose in zone R = (2200/8760) *E20*E32/1000
C46	2012 collective dose in zone S = (2200/8760) *E21*E33/1000
C47	2012 collective dose in zone T = (2200/8760) *E22*E34/1000
C48	2012 collective dose in zone W = (2200/8760) *E23*E35/1000
D40	2013 collective dose in zone B = (2200/8760) *F15*F27/1000
D41	2013 collective dose in zone C = (2200/8760) *F16*F28/1000
D42	2013 collective dose in zone L = (2200/8760) *F17*F29/1000



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
D43	2013 collective dose in zone O = (2200/8760) *F18*F30/1000
D44	2013 collective dose in zone P = (2200/8760) *F19*F31/1000
D45	2013 collective dose in zone R = (2200/8760) *F20*F32/1000
D46	2013 collective dose in zone S = (2200/8760) *F21*F33/1000
D47	2013 collective dose in zone T = (2200/8760) *F22*F34/1000
D48	2013 collective dose in zone W = (2200/8760) *F23*F35/1000
E40	2014 collective dose in zone B = (2200/8760) *G15*G27/1000
E41	2014 collective dose in zone C = (2200/8760) *G16*G28/1000
E42	2014 collective dose in zone L = (2200/8760) *G17*G29/1000
E43	2014 collective dose in zone O = (2200/8760) *G18*G30/1000
E44	2014 collective dose in zone P = (2200/8760) *G19*G31/1000
E45	2014 collective dose in zone R = (2200/8760) *G20*G32/1000
E46	2014 collective dose in zone S = (2200/8760) *G21*G33/1000
E47	2014 collective dose in zone T = (2200/8760) *G22*E34/1000
E48	2014 collective dose in zone W = (2200/8760) *G23*G35/1000
F40	2015 collective dose in zone B = (2200/8760) *H15*H27/1000
F41	2015 collective dose in zone C = (2200/8760) *H16*H28/1000
F42	2015 collective dose in zone L = (2200/8760) *H17*H29/1000
F43	2015 collective dose in zone O = (2200/8760) *H18*H30/1000
F44	2015 collective dose in zone P = (2200/8760) *H19*H31/1000
F45	2015 collective dose in zone R = (2200/8760) *H20*H32/1000
F46	2015 collective dose in zone S = (2200/8760) *H21*H33/1000
F47	2015 collective dose in zone T = (2200/8760) *H22*H34/1000
F48	2015 collective dose in zone W = (2200/8760) *H23*H35/1000
G40	2016 collective dose in zone B = (2200/8760) *I15*I27/1000



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
G41	2016 collective dose in zone C = (2200/8760) *I16*I28/1000
G42	2016 collective dose in zone L = (2200/8760) *I17*I29/1000
G43	2016 collective dose in zone O = (2200/8760) *I18*I30/1000
G44	2016 collective dose in zone P = (2200/8760) *I19*I31/1000
G45	2016 collective dose in zone R = (2200/8760) *I20*I32/1000
G46	2016 collective dose in zone S = (2200/8760) *I21*I33/1000
G47	2016 collective dose in zone T = (2200/8760) *I22*I34/1000
G48	2016 collective dose in zone W = (2200/8760) *I23*I35/1000
H40	2017 collective dose in zone B = (2200/8760) *J15*J27/1000
H41	2017 collective dose in zone C = (2200/8760) *J16*J28/1000
H42	2017 collective dose in zone L = (2200/8760) *J17*J29/1000
H43	2017 collective dose in zone O = (2200/8760) *J18*J30/1000
H44	2017 collective dose in zone P = (2200/8760) *J19*J31/1000
H45	2017 collective dose in zone R = (2200/8760) *J20*J32/1000
H46	2017 collective dose in zone S = (2200/8760) *J21*J33/1000
H47	2017 collective dose in zone T = (2200/8760) *J22*J34/1000
H48	2017 collective dose in zone W = (2200/8760) *J23*J35/1000
I40	Collective dose in zone B = C40 + D40 + E40 + F40 + G40 + H40
I41	Collective dose in zone C = C41 + D41 + E41 + F41 + G41 + H41
I42	Collective dose in zone L = C42 + D42 + E42 + F42 + G42 + H42
I43	Collective dose in zone O = C43 + D43 + E43 + F43 + G43 + H43
I44	Collective dose in zone B = C44 + D44 + E44 + F44 + G44 + H44
I45	Collective dose in zone B = C45 + D45 + E45 + F45 + G45 + H45
I46	Collective dose in zone B = C46 + D46 + E46 + F46 + G46 + H46
I47	Collective dose in zone B = C47 + D47 + E47 + F47 + G47 + H47



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
I48	Collective dose in zone B = C48 + D48 + E48 + F48 + G48 + H48
C49	2012 collective dose = C40 + C41 + C42 + C43 + C44 + C45 + C46 + C47 + C48
D49	2013 collective dose = D40 + D41 + D42 + D43 + D44 + D45 + D46 + D47 + D48
E49	2014 collective dose = E40 + E41 + E42 + E43 + E44 + E45 + E46 + E47 + E48
F49	2015 collective dose = F40 + F41 + F42 + F43 + F44 + F45 + F46 + F47 + F48
G49	2016 collective dose = G40 + G41 + G42 + G43 + G44 + G45 + G46 + G47 + G48
H49	2017 collective dose = H40 + H41 + H42 + H43 + H44 + H45 + H46 + H47 + H48
I49	Total collective dose = I40 + I41 + I42 + I43 + I44 + I45 + I46 + I47 + I48
Row 52 and 53	Criteria used to determine dose rates in Rows 55-65
A56 through A64	Zone Code
B56 through B64	Zone Description
C56	Maximum dose rate in zone B = maximum value in Dose Rate worksheet column AK where Dose Rate worksheet column F = B
C57	Maximum dose rate in zone C = maximum value in Dose Rate worksheet column AK where Dose Rate worksheet column F = C
C58	Maximum dose rate in zone L = maximum value in Dose Rate worksheet column AK where Dose Rate worksheet column F = L
C59	Maximum dose rate in zone O = maximum value in Dose Rate worksheet column AK where Dose Rate worksheet column F = O
C60	Maximum dose rate in zone P = maximum value in Dose Rate worksheet column AK where Dose Rate worksheet column F = P
C61	Maximum dose rate in zone R = maximum value in Dose Rate worksheet column AK where Dose Rate worksheet column F = R
C62	Maximum dose rate in zone S = maximum value in Dose Rate worksheet column AK where Dose Rate worksheet column F = S
C63	Maximum dose rate in zone T = maximum value in Dose Rate worksheet column AK where Dose Rate worksheet column F = T
C64	Maximum dose rate in zone W = maximum value in Dose Rate worksheet column AK where Dose Rate worksheet column F = W



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
C65	Maximum dose rate = maximum value in Dose Rate worksheet column AK
D56	Maximum gaseous dose rate in zone B = maximum value in Dose Rate worksheet column S where Dose Rate worksheet column F = B
D57	Maximum gaseous dose rate in zone C = maximum value in Dose Rate worksheet column S where Dose Rate worksheet column F = C
D58	Maximum gaseous dose rate in zone L = maximum value in Dose Rate worksheet column S where Dose Rate worksheet column F = L
D59	Maximum gaseous dose rate in zone O = maximum value in Dose Rate worksheet column S where Dose Rate worksheet column F = O
D60	Maximum gaseous dose rate in zone P = maximum value in Dose Rate worksheet column S where Dose Rate worksheet column F = P
D61	Maximum gaseous dose rate in zone R = maximum value in Dose Rate worksheet column S where Dose Rate worksheet column F = R
D62	Maximum gaseous dose rate in zone S = maximum value in Dose Rate worksheet column S where Dose Rate worksheet column F = S
D63	Maximum gaseous dose rate in zone T = maximum value in Dose Rate worksheet column S where Dose Rate worksheet column F = T
D64	Maximum gaseous dose rate in zone W = maximum value in Dose Rate worksheet column S where Dose Rate worksheet column F = W
D65	Maximum gaseous dose rate = maximum value in Dose Rate worksheet column S
E56	Maximum 10 CFR 50 gaseous organ dose in zone B = maximum value in Dose Rate worksheet column T where Dose Rate worksheet column F = B
E57	Maximum 10 CFR 50 gaseous organ dose in zone C = maximum value in Dose Rate worksheet column T where Dose Rate worksheet column F = C
E58	Maximum 10 CFR 50 gaseous organ dose in zone L = maximum value in Dose Rate worksheet column T where Dose Rate worksheet column F = L
E59	Maximum 10 CFR 50 gaseous organ dose in zone O = maximum value in Dose Rate worksheet column T where Dose Rate worksheet column F = O
E60	Maximum 10 CFR 50 gaseous organ dose in zone P = maximum value in Dose Rate worksheet column T where Dose Rate worksheet column F = P
E61	Maximum 10 CFR 50 gaseous organ dose in zone R = maximum value in Dose Rate worksheet column T where Dose Rate worksheet column F = R



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
E62	Maximum 10 CFR 50 gaseous organ dose in zone S = maximum value in Dose Rate worksheet column T where Dose Rate worksheet column F = S
E63	Maximum 10 CFR 50 gaseous organ dose in zone T = maximum value in Dose Rate worksheet column T where Dose Rate worksheet column F = T
E64	Maximum 10 CFR 50 gaseous organ dose in zone W = maximum value in Dose Rate worksheet column T where Dose Rate worksheet column F = W
E65	Maximum 10 CFR 50 gaseous organ dose = maximum value in Dose Rate worksheet column T
F56	Maximum liquid dose rate in zone B = maximum value in Dose Rate worksheet column Q where Dose Rate worksheet column F = B
F57	Maximum liquid dose rate in zone C = maximum value in Dose Rate worksheet column Q where Dose Rate worksheet column F = C
F58	Maximum liquid dose rate in zone L = maximum value in Dose Rate worksheet column Q where Dose Rate worksheet column F = L
F59	Maximum liquid dose rate in zone O = maximum value in Dose Rate worksheet column Q where Dose Rate worksheet column F = O
F60	Maximum liquid dose rate in zone P = maximum value in Dose Rate worksheet column Q where Dose Rate worksheet column F = P
F61	Maximum liquid dose rate in zone R = maximum value in Dose Rate worksheet column Q where Dose Rate worksheet column F = R
F62	Maximum liquid dose rate in zone S = maximum value in Dose Rate worksheet column Q where Dose Rate worksheet column F = S
F63	Maximum liquid dose rate in zone T = maximum value in Dose Rate worksheet column Q where Dose Rate worksheet column F = T
F64	Maximum liquid dose rate in zone W = maximum value in Dose Rate worksheet column Q where Dose Rate worksheet column F = W
F65	Maximum liquid dose rate = maximum value in Dose Rate worksheet column Q
A70 through A78	Zone Code
B70 through B78	Zone Description
C70	Dose rate in zone B based on 2200 hrs/yr occupancy = $C56 \cdot (2200/8760)$
C71	Dose rate in zone C based on 2200 hrs/yr occupancy = $C57 \cdot (2200/8760)$



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

Cell(s)	Contents
C72	Dose rate in zone L based on 2200 hrs/yr occupancy = $C58 \times (2200/8760)$
C73	Dose rate in zone O based on 2200 hrs/yr occupancy = $C59 \times (2200/8760)$
C74	Dose rate in zone P based on 2200 hrs/yr occupancy = $C60 \times (2200/8760)$
C75	Dose rate in zone R based on 2200 hrs/yr occupancy = $C61 \times (2200/8760)$
C76	Dose rate in zone S based on 2200 hrs/yr occupancy = $C62 \times (2200/8760)$
C77	Dose rate in zone T based on 2200 hrs/yr occupancy = $C63 \times (2200/8760)$
C78	Dose rate in zone W based on 2200 hrs/yr occupancy = $C64 \times (2200/8760)$
C79	Maximum dose rate in any zone = maximum of cells C70-C78

7.0 RESULTS

The potential radiological impact of the normal operation of SSES Units 1 and 2 on BBNPP construction workers has been determined. This demonstrates that BBNPP construction workers can be treated, for the purposes of radiation protection, as members of the general public.

However, the source list, source strength, and worker location, occupancy, and population will have to be monitored and the dose rates and collective doses re-evaluated periodically because the source inventory and source strengths cannot be accurately projected into the future.

8.0 REFERENCES

1. Susquehanna Steam Electric Station Units 1 and 2 License Renewal Application, Appendix E, Applicant's Environmental Report - Operating License Renewal Stage, Susquehanna Steam Electric Station, PPL Susquehanna LLC, September 2006.
2. AREVA NP Document 38-9116988-002, BBNPP COLA, Revision 2 (UniStar letter UN#10-040, dated March 4, 2010)
3. Code of Federal Regulations, Title 10, Part 20.1301, "Dose Limits for Individual Members of the Public," January 2007.
4. Code of Federal Regulations, Title 10, Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light Water Cooled Nuclear Power Reactor Effluents," 2007.
5. Code of Federal Regulations, Title 40, Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations," 2007.
6. U.S. Nuclear Regulatory Commission Regulatory Guide 1.109, Revision 1, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," October 1977.



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

7. U.S. Environmental Protection Agency, Office of Radiation Programs, Federal Guidance Report No. 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," Document Number EPA-52011-88-020, September 1988.
8. U.S. Environmental Protection Agency, Office of Radiation Programs, Federal Guidance Report No. 12, "External Exposure to Radionuclides in Air, Water, and Soil," Document Number EPA-402-R-93-081, September 1993.
9. AREVA Calculation 32-9079799-001, "BBNPP Dose Rate Equation for Normal Gaseous Effluents."
10. AREVA Calculation 32-9074035-000, "Dose to a Construction Worker at the Bell Bend Nuclear Power Plant Shoreline Due to Susquehanna Liquid Effluents."
11. AREVA Calculation 32-9082288-001, "BBNPP Dose Rate Equation for SSES ISFSI."
12. AREVA Calculation 32-9084600-001, "Dose to Construction Workers at Bell Bend from Skyshine and Direct Sources at SSES Units 1 and 2."
13. PP&L Drawing E105196, "Yard Equipment Locations," AREVA Document 38-9084910-000.
14. PP&L Susquehanna, LLC, "Susquehanna Steam Electric Station Units 1 & 2, Radioactive Effluent Release Report for 2006." (Reference used per AREVA Document 38-9085096-000, "Response to RFI EPR-08-394.")
15. Susquehanna Steam Electric Station Final Safety Analysis Report, Revision 62.
16. PP&L Calculation EC-ENVR-1025, "SSES Fuel Cycle 40 CFR 190 Dose Calculation," Revision 4, AREVA Document 38-9084726-000, (Reference used per AREVA Document 38-9085096-000, "Response to RFI EPR-08-394.").
17. PP&L Calculation EC-ENVR-2062, "SSES Maximum Offsite Dose Rate from ISFSI & Other Fuel Sources," Revision 0, AREVA Document 38-9084725-000, (Reference used per AREVA Document 38-9085096-000, "Response to RFI EPR-08-394.").
18. PP&L Document EC-RADN-1158, "Steam Dryer Radiation Dose Rates and Shielding Requirements for Storage Onsite," AREVA Document 38-9084724-000, (Reference used per AREVA Document 38-9085096-000, "Response to RFI EPR-08-394.").
19. AREVA Document 51-9044345-009, "Technical Input to COLA ER Section 4.5 for CCNPP Unit 3."
20. AREVA Document 38-7006487-000, "UniStar RFI#10-154 Response to AREVA RFI EPR 10-176 FSAR Section 2.3.4 & 2.3.5; ER Sections 2.1, 2.2, 2.7, 3.1, 4, 5, 6 & 7.1 regarding Grading & Drainage for BBNPP Plot Plan Change."
21. AREVA Document 38-9085096-000, "Response to RFI EPR-08-394."
22. PP&L Drawing Number C243786, "Susquehanna S.E.S. Unit 1 & 2 Site Facilities and Boundary Map," Revision 3.



Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations

APPENDIX A: OPEN ITEMS

Open Item	Description	Source of Information	Section	Resolution
#1	A map showing the physical location of the new Bell Bend Nuclear Power Plant relative to the existing Susquehanna Steam Electric Station was requested in RFI 08-394.	AREVA	Figures 1-1 and 6-1	Replaced with more legible figures.
#2	Reference 7 has not yet been filed in Documentum	32-9082288-000	Section 2.2.2	Reference 7 was revised to 32-9082288-001 and filed in Documentum. This EIR updated to reflect revisions.
#3	Item #7 in Reference 10 was insufficient. The information requested was BBNPP construction worker on site locations. The information supplied was unrelated commuting data for SSES workers. Reference 10 will need to be revised.	32-9085096-001	Section 3.2	The Reference COLA data will be used.
#4	The source inventory for SSES operating plants must be verified by someone at SSES.	RFI	Table 4-1	Verified via AREVA Document 38-9091132-000

Note: Product Upgrade List 92-9085037-000 was issued to track the status of the above noted open items and is now closed.