

**CALCULATION SUMMARY SHEET (CSS)**Document No. 32 - 9084874 - 004Safety Related: ☐ Yes ☒ NoTitle Dose to Construction Workers at the Bell Bend Nuclear Power Plant from Susquehanna Normal Operations**PURPOSE AND SUMMARY OF RESULTS:**

The purpose is to calculate the radiological impact of the normal operation of Susquehanna Steam Electric Station Units 1 & 2 to Bell Bend Nuclear Power Plant (BBNPP) construction workers and to demonstrate that BBNPP construction workers can be treated, for the purpose of radiation protection, as members of the public.

This calculation demonstrates that the construction workforce for BBNPP will meet the requirements of 10 CFR 20 for members of the general public. Radiological criteria in 10 CFR 50, Appendix I and 40 CFR 190 are also met for the duration of construction through 2017. The potential collective dose to construction workers is 6.18 person-rem.

Revision 003 implements DCR 113-7004519-000 (Plot Plan Change).

Revision 004 was created solely for the purpose of removing the "proprietary" wording from the document.

THE FOLLOWING COMPUTER CODES HAVE BEEN USED IN THIS DOCUMENT:

CODE/VERSION/REV	CODE/VERSION/REV
_____	_____
_____	_____
_____	_____

THE DOCUMENT CONTAINS  
ASSUMPTIONS THAT SHALL BE  
VERIFIED PRIOR TO USE☐ **YES**  
☒ **NO**



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

Review Method: ☒ Design Review (Detailed Check)  
☐ Alternate Calculation

## Signature Block

Name and Title (printed or typed)	Signature	P/R/A and LP/LR	Date	Pages/Sections Prepared/Reviewed/Approved
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**Note:** P/R/A designates Preparer (P), Reviewer (R), Approver (A);  
 LP/LR designates Lead Preparer (LP), Lead Reviewer (LR)

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**Record of Revision**

<b>Revision No.</b>	<b>Pages/Sections/Paragraphs Changed</b>	<b>Brief Description / Change Authorization</b>
000	All	Initial Release
001	Throughout	Made editorial changes Updated to reflect Revision 001 of Reference 9. Added discussion of 10 CFR 50, Appendix I dose compliance. Changed end of construction to 2017
	Section 1.1	Added description of relationship between the BBNPP construction site and the SSES protected and Owner Controlled Areas
	Figure 1-1, 6-1, and 6-2	Replaced with clearer figures (Closeout of Open Item #1)
	Section 3.1	Added assumption that construction workers do not consume any agricultural products.
	Section 3.2	Closed Open Item #3
	Figure 4-1	Added labels for legibility
	Figures 4-2 and 4-3	Added Figures to give reader a better visual of source locations.
	Section 6.0	Added documentation of spreadsheet calculation methodology
	Section 8.0	Deleted Reference 11. Added References for 10 CFR 50, Appendix I and 40 CFR 190. Added note about usage of PP& L Documents Closed Open Item #2
	Appendix A	Closed all Open Items.
002	Form 0402-001-F01	CSS template reformatted as per 0402-01-F01, Rev. 14.
	Throughout	Added the word "Reference" prior to each reference number.
	Page 1	Changed "Unit 3" to "BBNPP." Removed second "Summary of Results" as it was redundant. Added the word "potential" prior to "radiological impact" and prior to "collective dose."
	Record of Revisions	Corrected reference number that Revision 001 was revised to reflect.
	Section 1.1	Changed "new" to "proposed"
	Section 1.2	Capitalized the word "Section" throughout the section.
	Figure 1-1	Changed "Units 1&2" to "SSES 1&2." Changed "Unit 3" to "BBNPP." Added footnote regarding pertinent information.
	Section 2.2	Changed "calculated" to "estimated."

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### Record of Revision (continued)

Revision No.	Pages/Sections/Paragraphs Changed	Brief Description / Change Authorization
	Section 2.2.1	Abbreviated Susquehanna Steam Electric Station
	Section 2.2.2	Changed “all the exposure” to “all exposure”
	Section 4.1	Changed “will” to “may.” Moved Table 4-1 prior to Figures 4-1, 4-2, and 4-3 as it is referenced before the figures are referenced.
	Table 4-1	Corrected Figure referenced in footnote.
	Section 5.1	Stated that a Microsoft Excel spreadsheet is used to complete the calculation.
	Section 5.2	Added Section 5.2
	Section 6.0	Changed 2015 to 2017. Deleted Tables 6-1, and 6-3 through 6-11; deleted references to these tables; renumbered remaining Tables.
	Section 6.1	Corrected maximum dose for an occupational year.
	Section 6.2	Corrected column numbers of Tables 6-3 to 6-1 referenced in this section.
	Section 6.3	Corrected maximum dose for an occupational year.
	Section 6.5	Added section to explain spreadsheet manipulations.
	Section 7.0	Added “potential” prior to “radiological impact.” Changed “Unit 3” to “BBNPP.” Added “accurately” prior to “projected.”
	Section 8.0	Updated revision numbers of references 1,2, and 19; ensured that information obtained from these references is unchanged.
	Appendix A	Deleted Note 1 as it is no longer applicable.
003	Cover Sheet, Figure 1-1, Section 5.2, Section 6.1, Section 6.3, Section 6.4, Figure 6-1, Figure 6-2, Table 6-1, Table 6-2, Table 6-3, Table 6-4, Table 6-5, Table 6-6	Implementation of DCR 113-7004519-000 (Plot Plan Change).
	Section 1.1, Section 8.0	Added Reference 1, which was previously an embedded reference. Combined References 1 and 2 into Reference 2 per Regulatory Affairs guidance. Updated BBNPP acreage to match Rev 2 of COLA [Reference 2].
	Figure 1-1	Added reference in footnote.



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### Record of Revision (continued)

Revision No.	Pages/Sections/Paragraphs Changed	Brief Description / Change Authorization
	Section 2.1	Corrected abbreviation for Annual Radiological Effluent Release Report.
	Sections 2.2 and 4.2	Clarified that the gaseous effluents are from both the reactor building vents and the turbine building vents. Clarified that the turbine building source is skyshine to differentiate from the turbine building gaseous effluents.
	Section 2.2.1	Added citation to Reference 9 for greater clarity. Corrected years of site meteorology used and added footnote to explain discrepancy with Reference 9.
	Section 2.2.3	Corrected which end of ISFSI is loaded first as they were inverted. Corrected units of parameter k.
	Section 2.2.4 and Table 4-1	Added text regarding analysis of only the U2 CST.
	Section 3.2	Clarified justification for assumption of construction dates.
	Figures 4-2 and 4-3	Added citation for aerial images.
	Table 4-1	Corrected distance to reactor building vents and specified that the reactor building vent locations are from Figure 1-1 of Reference 14. Changed "Steam Dryers" to "Steam Dryer Storage vault" for consistency. Edited footnote to direct readers to the References from which the estimated locations were obtained.
	Section 4.2	Corrected citation.
	Section 4.3	Stated that worker census and occupancy is also in Table 4-3 and that this data is from the RCOLA and is used per Reference 21.
	Table 4-2	Stated that Reference 19 is used per Reference 21.
	Section 6.0	Corrected Section in which the dose rates are defined.
	Figure 6-2	Divided the figure into 18 sections for legibility purposes and added a key to the placement of the sections.
	Figures 6-1 and 6-2	Added legibility statements.
	Section 6.5.2	Added reference to Section 2.0
	Section 8.0	Corrected reference numbering, i.e., moved Reference 18 to Reference 13 and renumbered references 14-18 (previously 13-17). Updated Reference 19 to the latest revision. Added References 20, 21, and 22.



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**Record of Revision**  
(continued)

<b>Revision No.</b>	<b>Pages/Sections/Paragraphs Changed</b>	<b>Brief Description / Change Authorization</b>
	Throughout	Changed "Tower/Basin/Desalinization" to "Tower/Basin." Changed "Warehouse" to "Warehouse/Shops" Made minor editorial corrections.
004	All	This revision consisted only of the removal of the "Proprietary" statement from page 1, the removal of the word "Proprietary" from all other pages, and the change to the latest revision of the 0402-01 template.

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

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### 1.0 BACKGROUND

#### 1.1 Layout

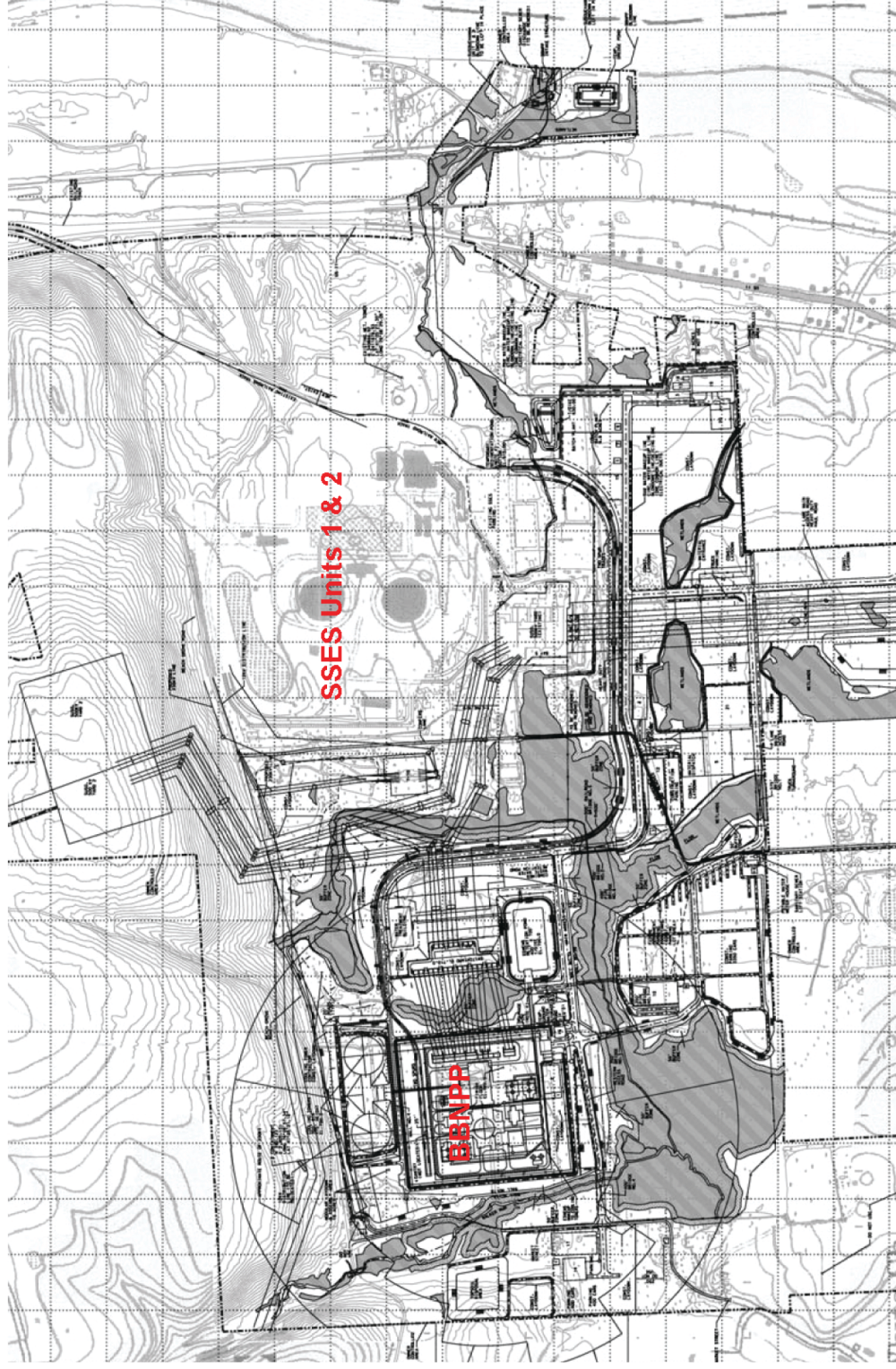
The physical location of the proposed Bell Bend Nuclear Power Plant (BBNPP) relative to the existing Susquehanna Steam Electric Station (SSES) is presented in Figure 1-1. As shown, BBNPP will be located west of the SSES site. Existing SSES plant structures occupy a developed area of approximately 487 acres (197 hectares) [Reference 1, Section 2.1]. BBNPP will be separated from SSES by a distance of approximately 5000 ft (1524 m). BBNPP and SSES will have separate protected areas [Reference 2, ER Section 3.1]. BBNPP will be located on 424 acres (172 hectares) within the 882 acres (357 hectares) BBNPP Owner Controlled Area to the west of and adjacent to SSES [Reference 2, ER Section 4.1.1.1].

#### 1.2 Radiation Requirements

Dose rate limits to the public are in 10 CFR Sections 20.1301 [Reference 3]. These apply since construction workers are members of the public for purposes of radiation protection. (Note that Section 20.1302 is about compliance and is not numeric.) For the same reason, 10 CFR 50, Appendix I [Reference 4] applies. 40 CFR 190 [Reference 5] applies because it is referred to in 10 CFR 20 and because most historical reported doses refer to this regulation. 10 CFR Sections 20.1001, 20.1201, 20.1203, 20.1204, and 20.1205 do not apply to the general public, but only to radiation workers. Thus, they will not be considered here.

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Figure 1-1: Site Layout\*



\* This drawing is taken from Reference 20. The purpose of this figure is to show the location of the three units. All other information is not pertinent.