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## 2 SITE CHARACTERISTICS

### 2.1 Geography and Demography

#### 2.1.1 Site Location and Description

##### 2.1.1.1 *Introduction*

The descriptions of the PSEG Site area and reactor location are used to assess the acceptability of the reactor site. The U.S. Nuclear Regulatory Commission (NRC) staff's review covers the following specific areas: (1) Specification of reactor location with respect to latitude and longitude, political subdivisions, and prominent natural and manmade features of the area; (2) map of the site area to determine the distance from the PSEG power block area to the boundary lines of the exclusion area, including consideration of the location, distance, and orientation of plant structures with respect to highways, railroads, and waterways that traverse or lie adjacent to the exclusion area; and (3) any additional information requirements prescribed in the applicable subparts to Title 10 of the *Code of Federal Regulations* (10 CFR) 52.17, "Contents of Applications; Technical Information." The purpose of the review is to ascertain the accuracy of the applicant's description of the PSEG Site for use in independent evaluations of the exclusion area authority and control, the surrounding population, and nearby manmade hazards.

##### 2.1.1.2 *Summary of Application*

The applicant addressed the PSEG Site location and description in Site Safety Analysis Report (SSAR) Section 2.1.1, "Site Location and Description" of the Early Site Permit (ESP) application, in which the applicant provided site-specific information related to site location and description, including political subdivisions, natural and manmade features, population, highways, railways, waterways, and other significant features of the area. In SSAR Figure 1.2-1, "PSEG Site Location—6-Mile Radius," and SSAR Figure 1.2-2, "PSEG Site Location—50-Mile Radius," the applicant showed the PSEG Site location and the surrounding area within 9.6 kilometers (km) (6 miles (mi)) and 80 km (50 mi), respectively, and identified the prominent natural and manmade features, including the Delaware River, towns, and major transportation routes.

##### 2.1.1.3 *Regulatory Basis*

The relevant requirements of NRC regulations for the site location and description and the associated acceptance criteria, are specified in NUREG-0800, Section 2.1.1, "Site Location and Description."

The applicable regulatory requirements for identifying site location and description are:

- 10 CFR 50.34(a)(1) (Contents of Applications; technical information), 10 CFR 52.17(a)(1) (Contents of Applications; technical information), and 10 CFR 52.79(a)(1) (Contents of Applications; technical information in final safety analysis report), as they relate to the inclusion in the safety analysis report (SAR) of a detailed description and safety assessment of the site where the facility will be located, with appropriate attention to features affecting facility design

- 10 CFR Part 100, “Reactor Site Criteria,” as it relates to the following: (1) Defining an exclusion area and setting forth requirements regarding activities in that area (10 CFR 100.3, “Definitions”); (2) addressing and evaluating factors that are used to determine the acceptability of the site as identified in 10 CFR 100.20, “Factors to be considered when evaluating sites,” subpart (b); (3) determining an exclusion area such that certain dose limits would not be exceeded in the event of a postulated fission product release as identified in 10 CFR 50.34(a)(1), as it relates to site evaluation factors identified in 10 CFR Part 100; and (4) requiring that the site location and the engineered features included as safeguards against the hazardous consequences of an accident, should one occur, would ensure a low risk of public exposure

#### **2.1.1.4      *Technical Evaluation***

SSAR Section 2.1.1 addresses the following information:

The PSEG Site is approximately 48.3 km (30 mi) southwest of Philadelphia, PA, 24 km (15 mi) south of the Delaware Memorial Bridge, and 12 km (7.5 mi) southwest of Salem, NJ. The nearest population center is the city of Wilmington, DE, with its nearest boundary distance of 23.8 km (14.8 mi) having an estimated population of 72,868 in 2007. The PSEG Site consists of approximately 2.97 km<sup>2</sup> (734 acres) of land, and with an anticipated acquisition of an additional 0.34 km<sup>2</sup> (85 acres) land from the U.S. Army Corp of Engineers (USACE), the PSEG Site will be 3.3 km<sup>2</sup> (819 acres).

SSAR Figure 1.2–2 shows the PSEG Site location and the surrounding area within 80 km (50 mi). The site location, natural and manmade features, including rivers and major transportation routes within 9.6 km (6 mi), are shown in SSAR Figure 1.2-1. The nearest railroad to the PSEG Site, the Southern Railroad of New Jersey, is 13.2 km (8.2 mi) to the northeast at its nearest point. The nearest highway, Delaware Route 9, is about 5 km (3.1 mi) to the west of the Delaware River from the PSEG Site. The nearest accessible highway, New Jersey Route 49, is 12 km (7.5 mi) to the northeast of the PSEG Site. Land access to the PSEG Site is limited to a road that PSEG constructed to connect its property to an existing secondary road, 5.8 km (3.6 mi) to the east of the PSEG Site. A new access causeway is proposed to support construction and operation of the new plant.

The staff reviewed SSAR Section 2.1.1 related to site location and description, including natural and manmade features, highways, railways, waterways, and other significant features of the area. The staff confirmed that the information in the application addresses the requirements for identifying PSEG Site location and description.

Using maps publicly available, the staff independently estimated and confirmed the latitude and longitude that the applicant supplied. The staff then converted this latitude and longitude to Universal Transverse Mercator (UTM) coordinates and verified the UTM coordinates of the PSEG Site reference point in the SSAR.

Coordinates for the power block reference point are provided in geodetic and UTM systems. SSAR Section 2.1.1.2 (Paragraph 2) and SSAR Figure 1.2–3 identified the UTM coordinates without units, which appear to be measured in feet. Therefore, in RAI 9, Question 02.01.01-1, the staff requested that the applicant annotate the list of UTM coordinates in the SSAR and to do so in the marginal notes on SSAR Figure 1.2-3 with the correct units of measure. In a March 21, 2011, response to RAI 9, Question 02.01.01-1, the applicant provided a revision to

SSAR text in Section 2.1.1.2 and SSAR Figure 1.2-3 with the English unit of measurement (in feet), and committed to revise the SSAR with this information. The staff reviewed the applicant's response and subsequently confirmed that SSAR Revision 1, submitted on May 21, 2012, contained the information as committed in the RAI response. Accordingly, the staff finds the applicant's response acceptable and considers RAI 9, Question 02.01.01-1, resolved.

The geodetic and UTM coordinates are as follows:

<b>Geodetic</b>		<b>UTM Coordinates (NAD83, Zone 18 (in meters))</b>	
<b>Latitude</b>	<b>Longitude</b>	<b>Northing</b>	<b>Easting</b>
N39° 28' 23.744"	W75° 32' 24.332"	4,369,427.579 m	453,544.585 m
		(14,335,392.324 ft)	(1,488,007.170 ft)

The PSEG proposed Exclusion Area Boundary (EAB) is a circle at least 600 m (1968 ft) from the edge of the power block area in all directions as shown in SSAR Figure 1.2-3. As shown in SSAR Figure 2.1-23, the proposed EAB extends beyond the PSEG Site property line to west (into the Delaware River) and to the north and northeast. The total area that the EAB encompasses is 3.0 km<sup>2</sup> (743 acres), of which 0.91 km<sup>2</sup> (224 acres) is in the Delaware River and 1.17 km<sup>2</sup> (288 acres) is in land that PSEG currently owns. PSEG will own an additional 0.344 km<sup>2</sup> (85 acres) of land when it completes property acquisition with the USACE. The land within the EAB that PSEG does not own consists of 0.59 km<sup>2</sup> (146 acres), which the Federal Government owns. No public roads, railroads, or structures other than the existing PSEG power plant facilities are located within any part of the EAB. From the information in SSAR Section 2.1.1.2 and SSAR Figure 1.2-3, it appears to the staff that the additional 0.344 km<sup>2</sup> (85 acres) of land is bounded by the area, as described in "PSEG Proposed New Property Line." In RAI 9, Question 02.01.01-2, the staff requested that the applicant distinguish the different areas in EAB and clarify them in SSAR Section 2.1.1.2 and SSAR Figure 1.2-3 accordingly. In a March 21, 2011, response to RAI 9, Question 02.01.01-2, the applicant provided clarification along with proposed revisions to SSAR Section 2.1.1.2 and SSAR Figure 1.2-3. The staff reviewed the response and found the applicant's clarification appropriate and adequate, and therefore acceptable. The staff also confirmed the inclusion of the proposed revisions in SSAR Section 2.1.1.2 and SSAR Figure 1.2-3, Revision 1, submitted on May 21, 2012. Accordingly, the staff considers RAI 9, Question 02.01.01-2, resolved.

The land boundary, on which technical specification limits for release of gaseous radioactive effluents are based, is the PSEG Site property line shown in SSAR Figure 1.2-3. The minimum distance from the center point to the property line is 265.8 m (872 ft) in the west direction. The staff notes this suggests that it is one of the site boundary receptor locations being considered for dose evaluation. However, in a September 9, 2011, response to RAI 35, Question 02.03.05-04 (on SSAR Section 2.3.5, "Long-Term Atmospheric Dispersion Estimates for Routine Releases"), the applicant stated that although X/Q and D/Q values have been calculated for all 16 radial directions at the PSEG Site boundary including the PSEG Site boundary location receptor addressed above at 265.8 m (872 ft) in the west direction, sectors adjacent to the Delaware River (sectors SE to NW in clockwise direction) are not considered in the dose evaluations. Therefore, in follow up RAI 49, Question 02.01.01-3, the staff requested that the applicant update the information in SSAR Section 2.1.1.3 for clarity and consistency. In a February 24, 2012, response, the applicant provided information clarifying and justifying

why sectors adjacent to the Delaware River are not considered in the dose evaluations. The applicant also committed to revise SSAR Section 2.1.1.3 with this information. The applicant specifically stated in the February 24, 2012, response to RAI 49, Question 02.01.01-3, that the X/Q and D/Q values (SSAR Table 2.3-37) at the PSEG Site boundary, adjacent to the Delaware River (sectors SE to NW in clockwise direction), are not considered in the associated analyses for radiological exposure from routine gaseous effluents, and that excluding the area adjacent to the Delaware River is acceptable because of the negligible time any individual is expected to spend in this area during any one-year period. The applicant further stated that the X/Q and D/Q values considered in the associated analyses for radiological exposure due to the routine gaseous effluents are those in sectors NNW to ESE (clockwise direction). The staff reviewed the applicant's response, clarification, and conclusion that doses resulting from radiological exposure will be negligible based on short-term presence of individuals in this area during any one-year period. The staff finds the applicant's clarification appropriate and adequate, and therefore acceptable. The staff also confirmed the inclusion of the proposed revision in SSAR Section 2.1.1.3, Revision 1, submitted on May 21, 2012. Accordingly, the staff considers RAI 49, Question 02.01.01-3, resolved.

The staff reviewed the site area map in the SSAR (Figure 1.2-3) for the proposed PSEG Site to verify that the distance from the proposed power block to the boundary line of the exclusion area meets the guidance in NUREG-0800, Section 2.1.1. Based on its review of the information in the SSAR, and confirmatory review of prominent, natural, and manmade features of the area as found in publicly available documentation, the staff finds the information provided by the applicant with regard to the PSEG Site location and description adequate and acceptable.

### **2.1.1.5      *Conclusion***

As discussed above, the applicant presented and substantiated information to establish the PSEG Site location and description, which includes the information submitted by the applicant in response to RAIs. The staff reviewed the information that the applicant submitted and for the reasons given above, concludes that the applicant has established site characteristics and design parameters acceptable to meet the requirements of 10 CFR 52.17(a)(1), 10 CFR 100.3, and the radiological consequence evaluation factors in 10 CFR 50.34(a)(1). The staff also affirms that the applicant provided sufficient details about the PSEG Site location and site area, as documented in SSAR Sections 2.1.2, 2.1.3, and 13.3 and SSAR Chapter 15. These details allowed the staff to conclude that the applicant met the requirements in 10 CFR 52.17(a)(1) and 10 CFR Part 100 regarding site location and description.

## **2.1.2      *Exclusion Area Authority and Control***

### **2.1.2.1      *Introduction***

The descriptions of exclusion area authority and control are used to verify that the applicant's legal authority to determine and control activities within the designated exclusion area, as provided in the application, is sufficient to allow reviewers to assess the acceptability of the reactor site. The staff's review covers the following specific areas:

- establishing the applicant's legal authority to determine all activities within the designated exclusion area

- validating the applicant's authority and control to exclude or remove personnel and property from the area in the event of an emergency
- establishing that proposed or permitted activities in the exclusion area that are unrelated to operation of the reactor do not result in a significant hazard to public health and safety
- requesting any additional information requirements prescribed in 10 CFR 52.17

### **2.1.2.2      *Summary of Application***

The applicant identified the exclusion area boundary and addressed the authority and control of the area in the case of an emergency. The applicant addressed the information pertaining to ownership, activities, authority and control, including arrangements for traffic control.

### **2.1.2.3      *Regulatory Basis***

The relevant requirements of NRC regulations for exclusion area authority and control and the associated acceptance criteria, are specified in NUREG-0800, Section 2.1.2, "Exclusion Area Authority and Control," as well as Review Standard (RS)-002, "Processing Applications for Early Site Permits."

The applicable regulatory requirements for verifying exclusion area authority and control are:

- 10 CFR 50.34(a)(1) and 10 CFR 52.17(a)(1), as they relate to the inclusion in the site SAR of a detailed description and safety assessment of the site on which the facility is to be located, with appropriate attention to features affecting facility design
- 10 CFR Part 100, as it relates to the following: (1) Defining an exclusion area and setting forth requirements regarding activities in that area (10 CFR 100.3); (2) addressing and evaluating factors that are used to determine the acceptability of the site as identified in 10 CFR 100.20(b); and (3) determining an exclusion area such that certain dose limits would not be exceeded in the event of a postulated fission product release as identified in 10 CFR 50.34(a)(1) as it relates to site evaluation factors identified in 10 CFR Part 100

### **2.1.2.4      *Technical Evaluation***

In SSAR Section 2.1.2.1, the applicant stated that PSEG owns 1.17 km<sup>2</sup> (288 acres) of the land within the proposed EAB with mineral rights. In addition, PSEG is working with the USACE to acquire 0.34 km<sup>2</sup> (85 acres) of land, including mineral rights that will be within the proposed EAB. When the property acquisition is completed, PSEG will have ownership of 1.51 km<sup>2</sup> (373 acres) of land within the proposed EAB, as shown in SSAR Figure 2.1–23. The only land within the proposed EAB that PSEG will not own is the 0.59 km<sup>2</sup> (146 acres) located to the north and northeast of the PSEG property line. The Federal Government owns this land, and the USACE controls it. On March 10, 2014, the NRC staff conducted a public meeting with PSEG (teleconference format) in order to discuss the regulatory considerations relating to ownership and control of land within the EAB and to clarify corresponding information in the SSAR. Subsequently, on April 3, 2014, PSEG submitted clarifying revisions to SSAR Section 2.1.2 describing ownership and control arrangements within the EAB and proposing Permit Condition 1, which is presented in Section 2.1.2.5 of this report. According to the submitted information and as memorialized in Permit Condition 1, with respect to the 0.59 km<sup>2</sup> (146 acres)

parcel owned by the Federal government and currently controlled by the USACE, PSEG commits to obtaining legal authority from the USACE to either allow PSEG and its surrogates to determine all activities including exclusion or removal of personnel and property from the area or require that the USACE exercise control in a specified manner. The agreement will specify that no residences are allowed within the Exclusion Area. Some public uses of the land may be allowed, but PSEG will acquire the ability to remove and subsequently exclude people. The staff finds PSEG's descriptions of its arrangements for exclusion area authority and control, including proposed Permit Condition 1, acceptable because they ensure that PSEG will have appropriate authority to determine or control access and exclusion to areas within the EAB. Prior to issuance of a COL, PSEG, or other COL applicant referencing the ESP, shall complete the activities called for in Permit Condition 1 and submit notification of their completion to the NRC for staff verification. PSEG committed to revise SSAR Section 2.1.2 in a future update of the ESP application to incorporate the changes provided in Enclosure 1 to its April 3, 2014, letter. The staff identified this as **Confirmatory Item 2.1-1**.

According to the emergency plan (EP) submitted with the PSEG Site ESP application, the U.S. Coast Guard (USCG) is responsible for warning people in boats, assisting in traffic control of boats, and notifying people swimming, fishing, and boating on the Delaware River in the PSEG Site vicinity in the event of a radiological emergency. This agreement will be extended to address all open-water areas within the proposed EAB for the new plant. The USACE and USCG are the two primary agencies that interface with PSEG to establish control of the EAB. In the event of an emergency, other agencies, such as State and local police, fire departments, and State and county emergency management agencies will be activated in accordance with the emergency plan. They can be called upon to support PSEG's response during emergencies. PSEG Site EP, which is Part 5 of the PSEG Site ESP application, lists the roles and responsibilities of PSEG as well as those of all offsite agencies during an emergency.

The NRC guidance for the review of an ESP applicant's implementation of these requirements is provided in Review Standard (RS)-002, "Processing Applications for Early Site Permits," Attachment 2, Section 2.1.2, "Exclusion Area Authority and Control," and in NUREG-0800, "Standard Review Plan," Section 2.1.2, "Exclusion Area Authority and Control." In Section 2.1.2 of both RS-002 and NUREG-0800, the review guidance states that, in order to meet the requirements of 10 CFR Part 100, the applicant must demonstrate, before issuance of an ESP, that it has the authority within the exclusion area as 10 CFR 100.3 requires, otherwise, the applicant must provide reasonable assurance that such authority will be obtained prior to the start of construction. Absolute ownership of all lands within the exclusion area, including mineral rights, is considered to carry with it the required authority to determine all activities on the land and is acceptable.

In SSAR Section 2.1.2.2, the applicant addressed control of activities unrelated to plant operation. The applicant discussed planned acquisition of the 0.34 km<sup>2</sup> (85 acres) of land from the USACE, a confined disposal facility (CDF) that the USACE uses and which stretches into the EAB. The Federal Government owns this land area of the proposed EAB that includes CDF area of 0.34 km<sup>2</sup> plus another 0.25 km<sup>2</sup> totaling 0.59 km<sup>2</sup> (146 acres), all of which the USACE controls. The applicant's discussion of control of the EAB also included negotiations with the USACE and USCG; however, finalization of agreements on land acquisition was unclear to the staff. Therefore, in RAI 10, Questions 02.01.02-1, 02.01.02-2, and 02.01.02-3, the staff requested that the applicant update the discussions in SSAR Subsection 2.1.2, including any associated current or new figure(s) that confirm whether the area, annotated on SSAR Figure 1.2-3 (Site Utilization Plan) as "Dike Area," represents the CDF; and that the applicant

explain personnel involvement logistics in the dredged material disposal activity. In a March 22, 2011, response to RAI 10, Questions 02.01.02-1, 02.01.02-2, and 02.01.02-3, the applicant clarified each item and also proposed a revision to SSAR Section 2.1.2.2. The staff reviewed the applicant's response and finds the response acceptable as the applicant provided adequate clarifying information. However, the applicant did not submit with the response a markup of the proposed revision of or a regulatory commitment to revise SSAR Section 2.1.2.2, or Section 2.1.2 in general. Therefore, in follow up RAI 58, Questions 02.01.02-4, 02.01.02-5, and 02.01.02-6, the staff requested that the applicant integrate the applicable portions of the response to RAI 10, Questions 02.01.02-1, 02.01.02-2, and 02.01.02-3, into SSAR Section 2.1.2. The information expected in the applicant's response would clarify, and also allow the staff to evaluate, if the applicant would acquire appropriate legal authority and control over EAB, including the exclusion and removal of personnel and property in the event of an accident. In a March 30, 2012, response to RAI 58, Questions 02.01.02-4, 02.01.02-5, and 02.01.02-6, the applicant provided the proposed revisions to SSAR Section 2.1.2. The staff confirmed that the applicant's committed revisions are included in SSAR Revision 1, submitted on May 21, 2012. The staff finds that the information provided by the applicant adequately addressed the staff's request in RAI 10, Questions 02.01.02-1, 02.01.02-2, and 02.01.02-3, as well as in RAI 58, Questions 02.01.02-4, 02.01.02-5, and 02.01.02-6, thereby conforming to the guidance provided. Accordingly, the staff considers the RAI 10, Questions 02.01.02-1, 02.01.02-2, and 02.01.02-3, and RAI 58, Questions 02.01.02-4, 02.01.02-5, and 02.01.02-6, resolved.

The operating Salem Generating Station (SGS) and Hope Creek Generating Station (HCGS) have provisions to notify people in the EAB of the need to evacuate the area in an emergency. These provisions include sirens, plant page, and an agreement with the USCG. Provisions similar to those that are in effect for SGS and HCGS will be established for the new plant at the proposed PSEG Site. The USCG is responsible for controlling traffic on the Delaware River in the event of an emergency. No other arrangements for traffic control are required because no public roads, railways, or other waterways traverse the proposed EAB.

The applicant supplied the following information and the staff verified it: There are no residences and unauthorized commercial activities within the exclusion area; no public highways or railroads traverse the exclusion area, and there are no residents in the exclusion area. The staff verified for consistency that the EAB is the same as being considered for the radiological consequences in SSAR Chapter 15, "Transient and Accident Analysis" and SSAR Chapter 13, "Conduct of Operations," Section 13.3, "Emergency Plan."

The staff used publicly available maps and satellite pictures to verify that no publicly used transportation mode crosses the EAB; therefore, arrangements for the control of traffic in the event of an emergency are not required.

Using maps and satellite pictures, the staff verified that no public roads cross the exclusion area; therefore, neither relocation nor abandonment of roads is needed.

### **2.1.2.5      *Permit Condition***

Permit Condition 1: A COL applicant referencing this early site permit shall notify the Nuclear Regulatory Commission staff when the COL applicant has acquired the required authority and control over the Exclusion Area (prior to issuance of any combined license that references this ESP) and the basis for that conclusion, including the following agreements:

1. The COL applicant will complete the acquisition of 85 ac. of land, including mineral rights, from the USACE that is currently part of the confined disposal facility north of the site.
2. The COL applicant will modify the existing PSEG Site Radiological Emergency Response Plan and the existing PSEG Site Security Plan, and reach agreements with the USCG, to extend the protections for the Delaware River portion of the existing Salem and Hope Creek Exclusion Area to cover the Delaware River portion of the Exclusion Area related to the ESP.
3. The COL applicant will reach agreement with the USACE for any land within the EAB that will not be owned by the COL applicant to obtain legal authority from the USACE to either allow the COL applicant and its surrogates to determine all activities including exclusion or removal of personnel and property from the area or require that the USACE exercise that control in a specified manner.

#### **2.1.2.6 Conclusion**

As discussed above, the applicant presented and substantiated information concerning its plan to obtain legal authority and control of all activities within the designated exclusion area boundary. The staff reviewed the information and, for the reasons stated above, concludes that the applicant's designated exclusion area meets the requirements of 10 CFR 50.34(a)(1), 10 CFR 52.17(a)(1), 10 CFR Part 100, and 10 CFR 100.3 in determining the acceptability of the PSEG Site. The staff based its conclusion on the following:

- the applicant appropriately described the plant exclusion area
- the authority under which all activities within the exclusion area can be controlled
- the methods by which the relocation or abandonment of public roads that lie within the proposed exclusion area can be accomplished, if necessary
- the methods by which access and occupancy of the exclusion area can be controlled during normal operation and in the event of an emergency situation

The staff also considered that the applicant has or, prior to COL issuance as required by Permit Condition 1, will obtain the required authority to determine or control activities within the designated exclusion area, including the exclusion and removal of persons and property, and will establish acceptable methods for control of the designated exclusion area as described in the SSAR.

As discussed above, the applicant has provided details on current and future agreements in its SSAR and in proposed Permit Condition 1 concerning its plans to acquire land and/or legal authority to determine or control all activities within the designated exclusion area. The staff reviewed SSAR Section 2.1.2 along with responses to requests for additional information (RAIs), and for the reasons stated above and subject to Permit Condition 1 and resolution of Confirmatory Item 2.1-1, concludes that the applicant's designated exclusion area meets the requirements of 10 CFR 50.34(a)(1), and 10 CFR 52.17(a)(1), and 10 CFR Part 100 in determining the acceptability of the PSEG Site.

### **2.1.3 Population Distribution**

#### **2.1.3.1 *Introduction***

The description of population distributions addresses the need for information about the following:

- population in the site vicinity, including transient populations
- population in the exclusion area
- whether appropriate protective measures could be taken on behalf of the populace in the specified low-population zone (LPZ) in the event of a serious accident
- whether the nearest boundary of the closest population center having 25,000 or more residents is at least one and one-third times the distance from the reactor to the outer boundary of the LPZ
- whether the population density in the site vicinity is consistent with the guidelines given in Regulatory Guide (RG) 4.7, "General Site Suitability Criteria for Nuclear Power Stations," Regulatory Position C.4
- any additional information requirements prescribed in the applicable subparts to 10 CFR 52.17, "Contents of Applications; Technical Information"

#### **2.1.3.2 *Summary of Application***

The applicant addressed the population distribution surrounding the PSEG Site to an 80 km (50 mile) radius based on 2000 U.S. Census data, which was the most recent data at the time of submission of the ESP application. The population distribution was estimated in 10 concentric rings for 16 cardinal directional sectors. The 2010 populations were projected by using U.S. Census Bureau (USCB) growth rates for the years 2000 through 2008. From 2010 onward, population growth rates were derived from county population projections developed by the states of Delaware, Maryland, New Jersey, and Pennsylvania. The county population growth rates derived from these projections were used to extrapolate the baseline 2010 projections to 2021 and 2031 for appropriate counties within each of the four states. Population projections beyond 2031 were based on county-specific annual growth rates calculated for each county between 2021 and 2031. The county-specific growth rates for this 10-year period were used to obtain the population projections for each successive 10-year period (2041, 2051, 2061, 2071, and 2081). The applicant also addressed the transient population, low population zone, population center, and population density.

#### **2.1.3.3 *Regulatory Basis***

The relevant requirements of NRC regulations for population distribution and the associated acceptance criteria are specified in NUREG-0800, Section 2.1.3, "Population Distribution," as well as RS-002.

The applicable regulatory requirements pertinent to the review of population distribution are:

- 10 CFR 50.34(a)(1), as it relates to consideration of the site evaluation factors identified in 10 CFR 100.3.
- 10 CFR Part 100 (including consideration of population density), and 10 CFR 52.17, as they relate to provision by the applicant in the SSAR of the existing and projected future population profile of the area surrounding the site.
- 10 CFR 100.20, "Factors To Be Considered When Evaluating Sites," and 10 CFR 100.21, "Non-Seismic Site Criteria," requirements, as they relate to determining the acceptability of a site. In 10 CFR 100.3, 10 CFR 100.20(a), and 10 CFR 100.21(b), the NRC provides definitions and other requirements to determine an exclusion area, LPZ, and population center distance.

The related acceptance criteria from NUREG-0800, Section 2.1.3 and RS-002 are as follows:

Population Data: The information on population data that the applicant supplied in the SSAR is acceptable under the following conditions: SSAR (1) includes present and future population data for the life of the plant from the latest census data and projected population; (2) describes the methodology and sources used to obtain the population data, including the projections; and (3) includes information on transient populations in the site vicinity.

Exclusion Area: The exclusion area should not have any residents or such residents should be subject to ready removal if necessary.

Low-Population Zone: The specified LPZ is acceptable if it is determined that appropriate protective measures could be taken on behalf of the enclosed populace in the event of a serious accident.

Nearest Population Center Boundary: The nearest boundary of the closest population center having 25,000 or more residents is at least one and one-third times the distance from the reactor to the outer boundary of the LPZ.

Population Density: If the population density exceeds the guidelines given in RG 4.7, "General Site Suitability Criteria for Nuclear Power Stations," Regulatory Position C.4, the applicant must give special attention to considering alternative sites with lower population densities.

#### **2.1.3.4      *Technical Evaluation***

The staff reviewed SSAR Section 2.1.3 and confirmed that the application addressed the required information relating to population distribution.

The staff reviewed the data on the population in the PSEG Site environs, as presented in SSAR Sections 2.1.1, 2.1.2, and 2.1.3, to determine whether the exclusion area, LPZ, and nearest population center distance for the proposed site comply with the requirements of 10 CFR Part 100. The staff also evaluated whether, consistent with RG 4.7, Regulatory Position C.4, the applicant should consider alternative sites with lower population densities. Further, the staff reviewed whether appropriate protective measures could be taken on behalf of the enclosed populace within the Emergency Planning Zone (EPZ), which encompasses the LPZ, in the event of a serious accident.

Based on the 2000 U.S. Census data, an estimated 33,871 residents are located within 16.2 km (10 mi) of the PSEG Site. No population exists within 3.2 km (2 mi) of the PSEG Site, and it is estimated that 75 individuals are within 3.2 to 4.8 km (2 to 3 mi). Based on population projections, the population within 16.1 km (10 mi) of the PSEG Site is expected to increase to 42,743 in 2010, 45,527 in 2021 (first year of operation), and 60,892 in 2081 (end of plant operating life). The population projections, including those for residents and transients, within 16.1 km (10 mi) of the PSEG Site for the years 2010 through 2081 are presented in SSAR Figures 2.1-4 through 2.1-11.

Based on the 2000 U.S. Census data, an estimated 5,230,454 residents are located within 80 km (50 mi) of the PSEG Site. The population within 16.1 to 80 km (10 to 50 mi) of the PSEG Site is projected to increase to 5,418,212 in 2010, 5,760,985 in 2021, and 8,077,743 in 2081. The population projections between 16.1 and 80 km (10 and 50 mi) from the PSEG Site for the years 2000 through 2081 are presented in SSAR Figures 2.1-12 through 2.1-20.

In addition to the permanent residents within 16.1 km (10 mi) of the PSEG Site, there are people who are considered transient that enter this area on a regular basis for employment, education, recreation, and medical care. SSAR Table 2.1-3 provides the sources of transient populations within 16.1 km (10 mi) of the PSEG Site and provides estimated populations for 2008. SSAR Table 2.1-4 presents estimated projected transient populations for 2010 and 2081, with the assumption that the transient populations grow at the same rate as that of resident populations. The total transient population within 16.1 km (10 mi) is projected to be 12,549 in 2010, increasing to 13,378 in 2021 and 18,063 in 2081.

The transient population within 16.1 and 80 km (10 and 50 mi) include major employment centers (Philadelphia, PA; Camden, Vineland, Millville, and Bridgeton, NJ; and Wilmington, Newark, and Dover, DE), major public recreation areas, shopping malls, Delaware Park (a casino and racetrack) located in Wilmington, DE. The estimated total 2008 employment figure for the metropolitan areas is 1,676,400 as shown in SSAR Table 2.1-5. Visitors to the recreation areas are 5,814,971 annually, as shown in SSAR Table 2.1-6. Annual visitors to the shopping malls are estimated to be 17,000,000, and to Delaware Park (a casino and racetrack) are approximately 2,900,000.

The proposed LPZ consists of an 8 km (5 mi) radius around the center point of the new plant as shown in SSAR Figure 2.1-21, along with a projected 2010 resident population. SSAR Table 2.1-7 lists facilities and institutions identified within the LPZ and 2008 transient populations. The staff noted that relative locations of facilities and institutions listed in SSAR Table 2.1-7 are inconsistent with SSAR Figure 2.1-21. Therefore, in RAI 32, Question 02.01.03-3, the staff requested that the applicant clarify the figure appropriately to identify facilities and routes. In an October 5, 2011, response, the applicant provided a revision to SSAR Section 2.1.3. Based on its review, the staff considers the response adequate and acceptable as it satisfies the guidance in NUREG-0800. The staff also confirmed that the applicant included the committed revision in SSAR Revision 1. Accordingly, the staff considers RAI 32, Question 02.01.03-3, resolved.

A list of the population centers (population of greater than 25,000) located within 80 km (50 mi) of the PSEG Site is presented in SSAR Table 2.1-8. The nearest population center is the city of Wilmington, DE, with the nearest boundary 23.8 km (14.8 mi) north of the proposed plant's center point. In distance, this point is greater than the required one and one-third times the distance from the center of the reactor to the LPZ boundary of 10.8 km (6.7 mi). Based on

independent review of the 2010 USCB population of 25,349 people, the staff identified Bridgeton, NJ, as another population center for consideration. Therefore, in RAI 32, Question 02.01.03-4, the staff requested that the applicant clarify the exclusion of Bridgeton, NJ, and also consider other population centers, such as Atlantic City, Cape May, and Wildwood areas of New Jersey. In an October 5, 2011, response, the applicant provided a revision to SSAR Section 2.1.3 to include Bridgeton, NJ, as a population center at a distance of 24.9 km (15.5 mi) and confirmed that Wilmington, DE, is still the nearest population center from the PSEG Site. Based on its review, the staff considers the applicant's response adequate and acceptable as it satisfies the guidance in NUREG-0800. The staff also confirmed that the applicant included the revision to SSAR Section 2.1.3, Revision 1. Accordingly, the staff considers RAI 32, question 02.01.03-4, resolved.

In SSAR Section 2.1.3.5, the applicant stated that the city of Wilmington, DE, with its nearest boundary 23.8 km (14.8 mi) north of the proposed plant's center, is the closest population center. The applicant stated that one and one-third times the distance from the proposed plant's center point to the proposed LPZ boundary is 10.8 km (6.7 mi). The applicant also stated that none of the distance or direction segments within 16 km (10 mi), as shown in SSAR Figure 2.1-11, has projected resident and transient population in the year 2081 that exceeds 25,000, although the segment from 8 to 16 km (5 to 10 mi) to the west of the PSEG Site approaches this 25,000 people criterion. Based on its review of information provided by the applicant and independent assessment of population data, the staff considers that Middletown, DE, with its nearest boundary 11.3 km (7.0 mi) west from the PSEG Site could be the nearest population center. Therefore, in RAI 32, Questions 02.01.03-5 and 02.01.03-6, the staff requested that the applicant analyze this information and population data and clarify based on growth rates from 2000 to 2010 U.S. Census, whether Middletown, DE, could be a future population center. If so, the staff requested that the applicant demonstrate compliance with population distance requirement in 10 CFR 100.21(b), such that the future growth and developments of Middletown, DE will not be closer than 11.3 km (7 mi) west of the PSEG Site, including growth into and around Odessa, DE, or discuss any changes to the current LPZ boundary. In an October 5, 2011, response, the applicant acknowledged Middletown, DE, as a potential future population center closer to the proposed plant than the existing population centers. The applicant provided detailed responses addressing the future growth of Middletown, DE, referring to zoning, growth, and development trends in the Middletown Comprehensive Plan, which stated that the potential for population growth to extend from Middletown, DE, into or around Odessa, DE, is severely restricted by zoning policies and physical barriers. The applicant also stated that PSEG does not intend to make any changes to the current LPZ boundary distance. The applicant proposed a revision to SSAR Section 2.1.3.5. The staff confirmed that the applicant's committed revisions are incorporated in SSAR Section 2.1.3.5, Revision 1. Based on its review of the applicant's responses and independent assessment of 2010 population census data, the staff considers the applicant's information reasonable and acceptable, as it satisfies the guidance in NUREG-0800. Accordingly, the staff considers RAI 32, Questions 02.01.03-5 and 02.01.03-6, resolved.

The applicant determined population density by using the estimated projected populations to the years 2010, 2021, 2061, and 2081. The applicant estimated population density of 497 people per square mile within 32.2 km (20 mi) of the PSEG Site, for year 2021, which is considered the first year of operation, and concluded that the density is within the guideline value of 500 people per square mile within 32.2 km (20 mi) of the PSEG Site. Based on its review of population projection data and independent assessment of the applicant's population projection estimates, the staff calculated the density of 508 people per square mile for the year

2021 without including the transient population between 16.1 and 32.2 km (10 and 20 mi). In addition, the staff notes that SSAR Section 2.1.3 does not clarify how transient population estimates are accounted for in determining population density. Therefore, in RAI 21, Questions 02.01.03-1 and 02.01.03-2, the staff requested that the applicant identify, clarify, and confirm as appropriate, the assumptions, methodologies, and rationale used to determine the population density. Since the applicant's determined density of 497 persons per square mile approaches the RG 4.7 criteria (500 persons per square mile) and any minor change in any of the assumptions may result in the density to be exceeding the criterion, in the same RAI, the staff also requested that the applicant address the evaluation of alternate sites with lower population densities in accordance with guidance specified in RG 4.7, Regulatory Position C.4. In a June 7, 2011, response to RAI 21, Questions 02.01.03-1 and 02.01.03-2, the applicant provided responses to the staff's concern with detailed information and clarification along with proposed revisions to SSAR Sections 2.1.3.3.2 and 2.1.3.6, and SSAR Tables 2.1-5 and 2.1-6. Based on its review and independent assessment of data, the staff considered the applicant's response adequate and reasonable as it satisfies the guidance in NUREG-0800 and meets the regulatory requirements. However, as a part of the June 7, 2011, response to RAI 21, Question 02.01.03-2, item (e), the applicant referred to the PSEG Site ESP Application, Part 3, "Environmental Report," Section 9.3 for alternative sites evaluation. The staff considers that this was not adequately addressed in SSAR Section 2.1.3. Therefore, in RAI 59, Question 02.01.03-7, which superseded RAI 21, Question 02.01.03-1, item (e), the staff requested that the applicant give a rationale for and justify the selection of this high-density site by providing information about the Alternative Site Evaluation analysis summary in SSAR Section 2.1.3. In a March 29, 2012, response to RAI 59, Question 02.01.03-7, the applicant provided adequate information and a proposed revision to SSAR Section 2.1.3.6. The staff reviewed the applicant's response and considers the information reasonable and acceptable as it conforms to the guidance in NUREG-0800. The staff also confirmed that the applicant's committed revisions are included in SSAR Revision 1. Accordingly, the staff considers RAI 21, Questions 02.01.03-1 and 02.01.03-2; and RAI 59, Question 02.01.03-7, resolved.

### **2.1.3.5      *Conclusion***

As discussed above, the applicant provided an acceptable description of current and projected population distribution, low population zone, population center distances, and population densities in and around the PSEG Site. The staff reviewed the information provided and, for the reasons stated above, concludes that the applicant has provided population data acceptable to meet the requirements of 10 CFR 50.34(a)(1), 10 CFR 52.17(vii), 10 CFR 100.20(a), 10 CFR 100.20(b), 10 CFR Part 100, and 10 CFR 100.3. This conclusion is based on the applicant providing an acceptable description and safety assessment of the PSEG Site. The site area contains present and projected population densities that conform to the guidelines of RG 4.7, Regulatory Position C.4, and the applicant properly specified the low-population zone and population center distance. Additionally, by assessing the population data independently, the staff reviewed and confirmed the applicant's estimates of the present and projected populations surrounding the PSEG Site, including transients. The applicant also calculated the radiological consequences of design-basis accidents at the outer boundary of the LPZ (Standard Review Plan (SRP) Chapter 15, Section 15.0.3) and has provided reasonable assurance that appropriate protective measures can be taken within the LPZ to protect the population in the event of a radiological emergency. Therefore, the staff finds that the PSEG Site ESP applicant has provided sufficient information to comply with the requirements of 10 CFR 50.34(a)(1), 10 CFR 52.17(vii), and 10 CFR Part 100.

## **2.2 Nearby Industrial, Transportation, and Military Facilities**

### **2.2.1 Identification of Potential Hazards in Site Vicinity (Locations and Routes)**

#### **2.2.1.1 *Introduction***

In the identification of potential hazards in the site vicinity, the description of locations and routes refers to potential external hazards or hazardous materials that are present or may reasonably be expected to be present during the projected lifetime of the proposed plant. The purpose of the staff's review of this section is to determine the adequacy of information in meeting regulatory requirements concerning the presence and magnitude of potential external hazards so that the staff can perform technical review and evaluation consistent with the guidance provided in NUREG-0800, Sections 2.2.3, 3.5.1.5, and 3.5.1.6. The staff's review covers the following specific areas: (1) The locations of, and separation distances to, transportation facilities and routes, including airports and airways, roadways, railways, pipelines, and navigable bodies of water; (2) the presence of military and industrial facilities, such as fixed manufacturing, processing, and storage facilities; and (3) any additional information requirements prescribed in the applicable subparts to 10 CFR 52.17, "Contents of Applications; Technical Information."

#### **2.2.1.2 *Summary of Application***

The applicant identified potential hazardous facilities and routes within the 8-km (5-mi) vicinity of the PSEG Site and airports within 16.1 km (10 mi) of the PSEG Site, along with significant facilities at a greater distance. The applicant provided detailed description of these facilities and routes for further consideration of hazards evaluation. There are four industrial facilities, three road transport routes, two waterways, three airways, six slow speed low-altitude military training routes, and a helipad within 8 km (5 mi) of the PSEG Site. There are 9 industrial facilities, 2 pipelines, 10 road transportation routes, 2 railroads, 2 waterways, and 13 airport or airways identified within 8 to 16.1 km (5 to 10 mi) of the PSEG Site.

#### **2.2.1.3 *Regulatory Basis***

The acceptance criteria for identification of potential hazards in the site vicinity are based on meeting the relevant requirements of 10 CFR 52.17 and 10 CFR Part 100. The staff considered the following regulatory requirements in reviewing the identification of potential hazards in the PSEG Site vicinity.

- 10 CFR 52.17, as it relates to the requirement that the application contain information on the location and description of any nearby industrial, military, or transportation facilities and routes.
- 10 CFR 100.20(b), as it relates to the requirement that the nature and proximity of man-related hazards (e.g., airports, dams, transportation routes, and military and chemical facilities) be evaluated to establish site parameters for use in determining whether a plant design can accommodate commonly occurring hazards and whether the risk of other hazards is very low.

- 10 CFR 100.21(e), as it relates to the requirement that the potential hazards associated with nearby transportation routes, industrial, and military facilities be evaluated and site parameters established such that potential hazards from such routes and facilities will not pose undue risk to the type of facility proposed to be located at the site.

Both NUREG-0800 and RS-002, Sections 2.2.1-2.2.2, specify that an applicant has submitted adequate information to meet the above requirements if the submitted information satisfies the following criteria:

- Data in the site safety assessment adequately describes the locations and distances of industrial, military, and transportation facilities in the vicinity of the plant, a nuclear power plant or plants of specified type that might be constructed on the proposed site, and agree with the data obtained from other sources, when available.
- Descriptions of the nature and extent of activities conducted at the site and nearby facilities, including the products and materials likely to be processed, stored, used, or transported, are adequate to permit identification of possible hazards.
- Sufficient statistical data related to hazardous materials are provided to establish a basis for evaluating the potential hazard to a nuclear power plant or plants of specified type that may be constructed on the proposed site.

#### **2.2.1.4      *Technical Evaluation***

The staff reviewed the SSAR using the review procedures described in NUREG-0800, Section 2.2.1-2.2.2. This section identifies and provides information that would help in evaluating potential hazards due to industrial, transportation, mining, and military installations in the PSEG Site area on the safe operation of the proposed nuclear facility.

In the SSAR, the applicant identified the following potential hazard facilities and operations within 8 km (5 mi) of the PSEG Site for further analysis.

##### Industrial facilities

- Hope Creek Generating Station (HCGS)
- Salem Generating Station (SGS) Units 1 and 2
- Port Penn Sewage Treatment Plant
- Lower Alloways Creek Township Buildings

##### Transportation Routes

- Alloway Creek Neck Road
- Delaware Route 9
- Quinton Hancocks Bridge Road

## Waterways

- Delaware River
- Alloway Creek

## Airports and Airways

- Airway V123-312
- Airway V29
- Jet Route J42-150
- Salem/Hope Creek Generating Station Helipad
- Slow speed low-altitude Military Routes (SR800, SR844, SR845, SR846, and SR847)

The identified facilities and transportation routes between 8 and 16.1 km (5 and 10 mi) from the PSEG Site are as follows:

## Industrial facilities

- Air Liquide
- Anchor Glass Container Corporation
- Cooper Interconnect
- Delaware City Wastewater Treatment Plant
- Formosa Plastics Corporation
- Johnson Controls Inc. Battery Division
- Mannington Mills
- Quaker City Motor Parts/NAPA Distribution Center
- Valero Delaware City Refinery

## Pipelines

- Hazardous Liquid Pipeline
- Natural Gas Pipeline

## Transportation Routes

- Delaware Route 1
- Delaware Route 299

- Delaware Route 72
- Delaware Route 7
- Delaware Route 71
- Delaware Route 896
- New Jersey Route 49
- New Jersey Route 45
- U.S. Route 13
- U.S. Route 301
- The Southern Railroad Company of NJ
- Norfolk Southern Railroad

#### Waterways

- Chesapeake and Delaware Canal
- Salem River

#### Airports and Airways

- Airway V157
- Airway V213
- Airway V214
- Hidden Acres Airport
- Jet Route J191
- Jet Route J51
- Okolona Plantation Airport
- Paruszewski Farm Strip Airport
- PSEG Training Center Heliport
- Salem Airport
- Scotty's Airport
- Stoe Creek Farm Airport

- Townsend Airport

The applicant identified nearby industrial facilities, transportation, and military facilities in SSAR Section 2.2.1 and presented the descriptions of these facilities in SSAR Section 2.2.2. The staff noted that some information depicted in SSAR Figure 2.2-1 is missing in SSAR Section 2.2.2 text, and some information as presented by the applicant in SSAR Section 2.2.2, is not consistent with the information as depicted in SSAR Figure 2.2-1. Therefore, in RAI 50, Question 02.02.01-02.02.02-1, the staff requested that the applicant provide clarification regarding the apparent inconsistencies, and update the information that may be used further in evaluating potential hazards in SSAR Section 2.2.3. In a March 9, 2012, response, the applicant clarified and updated the information pertaining to all items of the RAI 50, Question 02.02.01-02.02.02-1, except item (5), which the applicant committed to provide by July 20, 2012, after obtaining information from the USCG. The applicant also provided a revision to SSAR Section 2.2.1 and SSAR Figure 2.2-1. The staff confirmed that the committed revision was included in SSAR Revision 1, dated May 21, 2012. Accordingly, the staff considers RAI 50, Question 02.02.01-02.02.02-1 pertaining to all items except item (5), resolved. Subsequently, in a July 17, 2012, response to RAI 50, Question 02.02.01-02.02.02-1, item (5), the applicant provided adequate information and analysis. The applicant also committed to revise SSAR Sections 2.2.2.3.2, 2.2.3.2.2, and 2.2.3.2.3 in the subsequent revision of the application. The location of identified industrial and transportation facilities, and airports and airways within 16.1 km (10 mi) of the PSEG Site are shown in SSAR Revision 1, Figures 2.2-1 and 2.2-2, respectively. However, the staff noted that contrary to a commitment by the applicant in a March 13, 2012, response to RAI 40, Question 03.05.01.06-1 (which is discussed in Chapter 3, Section 3.5.1.6 of this report), Figure 2.2-2 was not revised based on revised airways information, and this revised Figure was not included in SSAR Revision 1, dated May 21, 2012. Subsequently, following a clarification communication by the staff, the applicant included Figure 2.2-2 in Revision 2 of the SSAR, dated March 27, 2013, and therefore, the staff considers RAI 50, Question 02.02.01-02.02.02-1, resolved.

The applicant provided detailed descriptions of the identified facilities and routes in SSAR Section 2.2.2 in accordance with NUREG-0800, RS-002, and RG 1.206, "Combined License Applications for Nuclear Power Plants."

#### **2.2.1.4.1 Industrial Facilities**

Four facilities are identified within 8 km (5 mi) of the PSEG Site, and nine facilities are identified within 8 to 16.1 km (5 to 10 mi). A concise description of these facilities is presented in SSAR Table 2.2-1.

The centerline of the HCGS reactor building is located 527 m (1,730 ft) south of the nearest edge of the power block area of the new plant. The HCGS chemicals identified for analysis and their locations are presented in SSAR Tables 2.2-2a and 2.2-3.

The centerline of the SGS Unit 1 reactor building is located 990 m (3,249 ft) of the nearest edge of the power block area of the new plant. The SGS chemicals identified for analysis and their locations are presented in SSAR Tables 2.2-2b and 2.2-3.

The Port Penn Sewage Treatment Plant is located in Delaware, 5.5 km (3.4 mi) northwest of the new plant power block area. The facility receives chemicals by truck with the closest possible approach being on Delaware Route 9, which is 5 km (3.1 mi) west of the new plant power block

area. The chemicals identified for analysis and their locations associated with Port Penn Sewage Treatment Plant are presented in SSAR Table 2.2-4.

Lower Alloways Township has several buildings that perform functions such as government administration, vehicle maintenance, and storage for the township. The chemicals identified are presented in SSAR Table 2.2-5.

#### **2.2.1.4.2 Pipelines**

The nearest pipeline is a gas transmission line that runs along the U.S. Route 13 corridor in Delaware, 9.5 km (5.9 mi) west of the new plant power block area.

#### **2.2.1.4.3 Waterways**

The Delaware River, Alloway Creek, the Chesapeake and Delaware Canal, and the Salem River are the only navigable waterways within 16.1 km (10 mi) of the PSEG Site.

The Delaware River is adjacent to the PSEG Site and is used for commercial freight traffic to and from ports in New Jersey, Delaware, and Pennsylvania. The waterway has a channel depth maintained at 12 m (39.3 ft) at low tide. The shipping channel's closest approach to the PSEG Site is 1.4 km (0.9 mi). The total quantities of chemicals transported on the Delaware River are presented in SSAR Table 2.2-6, the number of shipments is summarized in SSAR Table 2.2-7, and largest maximum net tonnage of chemicals transported is presented in SSAR Table 2.2-8. Several small marinas and docks exist along the Delaware River within 16.1 km (10 mi) of the PSEG Site. Two general anchorage areas are shown in SSAR Figure 2.2-3 within 8 km (5 mi) of the PSEG Site, the closest being 1.1 km (0.7 mi) away. However, these facilities are not addressed in SSAR Section 2.2.1. Therefore, in RAI 50, Question 02.02.01-02.02-02-1, item (5), the staff requested that the applicant address and evaluate, as appropriate, the impact of these facilities. On July 17, 2012, the applicant provided adequate response to clarify, analyze, and update the information. The staff reviewed the response and finds it acceptable as it meets the NUREG-0800 guidance and satisfies the acceptance criteria. The applicant provided changes to SSAR Sections 2.2.2.3.2, 2.2.3.2.2, and 2.2.3.2.3, with commitment to revise the ESP application with these changes. The staff finds the SSAR changes appropriate and acceptable. The staff confirmed that in Revision 2 of the application, submitted on March 27, 2013, the applicant has incorporated the committed changes, and, therefore, considers RAI 50, Question 02.02.01-02.02-02-1, item (5) resolved.

The Chesapeake and Delaware Canal carries commercial freight traffic between the Delaware River and the Chesapeake Bay. The canal's nearest approach to the new plant power block area is 9.5 km (5.9 mi) to the north-northwest. The canal has a mean low-water depth of 10.7 m (35 ft). The total quantities of chemicals transported on the Chesapeake and Delaware Canal are presented in SSAR Table 2.2-9.

The mouth of the Salem River is 10.6 km (6.6 mi) northeast of the new plant power block area. The largest two quantities of commodities shipped on the river are soil or fill dirt and food products.

#### **2.2.1.4.4 Mining Operations**

There are no mining activities within 8 km (5 mi) of the PSEG Site. The nearest mine is a sand-and-gravel mine, located just east of Middletown, DE, 11.3 km (7 mi) west of the new plant power block area.

#### **2.2.1.4.5 Highways**

Alloway Creek Neck Road is a secondary road that provides access to the PSEG Site, Mad Horse Creek Wildlife Management Area, and several farms. Facing the PSEG Site access road, Alloway Creek Neck Road runs east to the Town of Hancocks Bridge, where it connects to Quinton Hancocks Bridge Road. New Jersey Route 49 is the closest highway east of the PSEG Site, at its closest approach is 12.1 km (7.5 mi). A new second road is proposed to be constructed for dedicated vehicular access to the PSEG Site. The proposed causeway's land approach to the PSEG Site is depicted in SSAR Figure 1.2-3. Delaware Route 9 is the only highway within 8 km (5 mi) of the PSEG Site, at its closest approach 5 km (3.1 mi) west of the new plant power block area. A maximum of 36,364 kg (80,000 lbs) is estimated for chemical transportation on this route.

#### **2.2.1.4.6 Railroads**

There are no railroads within 8 km (5 mi) of the PSEG Site. The closest railroad is the Southern Railroad Company of New Jersey, which connects Salem to Alloway, and has the closest approach at 13.2 km (8.2 mi) to the northeast to this site.

#### **2.2.1.4.7 Airports, Airways, and Military Training Routes**

Airports: The helipad for SGS and HCGS is the only heliport or airport within 8 km (5 mi) of the PSEG Site. Additionally, there are seven airports and one heliport located within 8 to 16.1 km (5 to 10 mi) of the site. The estimated operations at these facilities are presented in SSAR Table 2.2-11. The nearest public airport is the Summit Airport, which is located 16.7 km (10.4 mi) from the proposed new plant's power block area. An evaluation of aircraft hazards is addressed in SSAR Section 3.5.1.6.

Airways: There are four Federal airways—V123-312, V29, V157, and V213—within 16.1 km (10 mi) of the PSEG Site. There are two high-altitude routes, J42-150 and J191. The closest six slow-speed low-altitude military training routes, as indicated in SSAR Figure 2.2-2, are SR800, SR805, SR844, SR845, SR846, and SR847. The nearest edges of the military training routes are within 8 km (5 mi) of the PSEG Site. The centerline of Airway V123-312 is 0.8 km (0.5 mi) northwest of the PSEG Site. Additionally, Airway V29 is 1.8 km (1.1 mi) west of the PSEG Site. Airway V157 is 1.4 km (0.9 mi) east of the PSEG Site. The centerline of jet way J42-150 is 1.3 km (0.8 mi) east of the PSEG Site with additional jet way, J191, located 15.6 km (9.7 mi) east of the PSEG Site.

Military Facilities: There are no military facilities within 16.2 km (10 mi) of the PSEG Site. New Castle Airport is the closest facility with military operations (the Air National Guard) and is 23.3 km (14.5 mi) northeast of the PSEG Site. The closest dedicated military facility is Dover Air Force Base, which is 38.3 km (23.8 mi) south of the PSEG Site.

The nature and extent of activities involving potentially hazardous materials at nearby industrial, military, and transportation facilities have been evaluated to identify any such activities that have

the potential for adversely affecting plant safety-related structures. Based on its review of the information in the SSAR as well as information obtained independently, the staff concludes that all potentially hazardous activities on site and in the vicinity of the plant have been identified. The staff has reviewed the hazards associated with these activities and discussed in Sections 2.2.3, 3.5.1.5, and 3.5.1.6 of this report. Based on its review of relevant information available in the public domain and applicable data, the staff verified the location and usage information that the applicant supplied.

#### **2.2.1.4.8 Projections of Industrial Growth**

No industrial growth projections are available in Salem County, NJ. However, the Salem County Utilities Authority identified areas in the county that are expected to undergo economic development. The projects include a recycling center in the city of Salem and a business and industrial park addition in Oldmans Township and Carneys Point, NJ. The projects identified in Salem County are more than 8 km (5 mi) from the PSEG Site.

The New Castle County, DE, Comprehensive Plan indicates that most of the land in the county is expected to remain agricultural or open space. A new wastewater treatment plant is planned at 9.5 km (5.9 mi) west of the PSEG Site, situated along U.S. Route 13. The planned wastewater treatment plant chemical delivery is not expected to approach any closer to the site than the existing facilities in New Castle County.

A review of available Salem and New Castle County planning documents indicate no significant expansion of military or transportation facilities located within 8 km (5 mi) of the PSEG Site. Based on its review of the information provided by the applicant in SSAR Sections 2.2.1-2.2.2, as well as information obtained independently, the staff did not identify any potential source of additional hazards beyond those that the applicant has identified and described.

#### **2.2.1.5 Conclusion**

As discussed above, the applicant presented and substantiated information to establish the identification of potential hazards in the PSEG Site vicinity. The staff reviewed the information provided and, for the reasons described above, concludes that the applicant has provided information with respect to identification of potential hazards in conformance to the guidance in NUREG-0800, as described in the "Regulatory Basis" section above, and in compliance with the requirements of 10 CFR 52.17(a)(1)(vii), 10 CFR 52.17(a)(1)(ix), as well as 10 CFR 100.20(b) and 10 CFR 100.21(e). The nature and extent of activities involving potentially hazardous materials that are conducted at nearby industrial, military, and transportation facilities have been evaluated to identify any such activities that have the potential for adversely affecting plant safety-related structures. On the basis of an evaluation of information in the SSAR as well as information obtained independently, the staff concludes that all potentially hazardous activities on site and in the vicinity of the plant have been identified. The hazards associated with these activities have been reviewed and are discussed in Sections 2.2.3, and 3.5.1.6 of this report.

#### **2.2.2 Descriptions of Locations and Routes**

The staff's review and conclusion involving SSAR Section 2.2.2 of the PSEG Site ESP application is documented in Section 2.2.1 of this report.

## **2.2.3 Evaluation of Potential Accidents**

### **2.2.3.1 *Introduction***

The staff's evaluation of potential accidents considers the applicant's probability analyses of potential accidents involving hazardous materials or activities on the PSEG Site and in the vicinity of the proposed PSEG Site to confirm that appropriate data and analytical models have been used. The review covers the following specific areas: (1) Hazards associated with nearby industrial activities, such as manufacturing, processing, or storage facilities; (2) hazards associated with nearby military activities, such as military bases, training areas, or aircraft flights; and (3) hazards associated with nearby transportation routes (aircraft routes, highways, railways, navigable waters, and pipelines). Each hazard review area includes consideration of the following principal types of hazards:

- toxic vapors or gases and their potential for incapacitating nuclear plant control room operators
- overpressure resulting from explosions or detonations involving materials such as munitions, industrial explosives, or explosive vapor clouds resulting from the atmospheric release of gases (such as propane and natural gas or any other gas) with a potential for ignition and explosion
- missile effects attributable to mechanical impacts, such as aircraft impacts, explosion debris, and impacts from waterborne items such as barges
- thermal effects attributable to fires

### **2.2.3.2 *Summary of Application***

The applicant evaluated potential accidents based on the information compiled for the identified facilities in SSAR Section 2.2.1-2.2.2, in accordance with regulatory requirements in 10 CFR 52.17, "Contents of Application," 10 CFR 100.20, "Factors To Be Considered When Evaluating Sites," and 10 CFR 100.21 "Using Non-Seismic Criteria," using the guidance in RG 1.78 (Revision 1), "Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," RG 1.91 (Revision 1), "Evaluation of Explosion Postulated To Occur at Nearby Facilities and on Transportation Routes Near Nuclear Power Plants," RG 4.7 (Revision 2), "General Site Suitability for Nuclear Power Plant Sustainability," and RG 1.206 (Revision 0), "Combined License Applications for Nuclear Power Plants." The applicant performed an analysis of these accidents to determine whether any of them should be considered as design-basis events (DBEs). The DBEs are defined as those accidents that have a probability of occurrence on the order of magnitude of  $10^{-7}$  per year or greater with potential consequences serious enough to affect the safety of the plant to the extent that the guidelines specified in 10 CFR Part 100 could be exceeded. The following accident categories are considered in selecting DBEs: Explosions: flammable vapor clouds (delayed ignition); toxic chemicals; aircraft crashes; fires; collisions with intake structures; and liquid spills.

### **2.2.3.3      *Regulatory Basis***

The acceptance criteria associated with the relevant requirements of NRC regulations for the evaluation of potential accidents are given in NUREG-0800, Section 2.2.3, "Evaluation of Potential Accidents."

The staff considered the following regulatory requirements in evaluating the potentiality and consequences of accident sequences:

- 10 CFR 52.17(a)(1)(vii), as it relates to the requirement that the application contain information on the location and description of any nearby industrial, military, or transportation facilities and routes and the requirements of 10 CFR 52.17(a)(1)(ix) as it applies to 10 CFR Part 100
- 10 CFR 100.20(b), as it relates to the nature and proximity of man-related hazards (e.g., airports, dams, transportation routes, and military and chemical facilities) that must be evaluated to establish site parameters for use in determining whether a plant design can accommodate commonly occurring hazards and whether the risk of other hazards is very low
- 10 CFR 100.21(e), as it relates to the requirement that the potential hazards associated with nearby transportation routes, industrial, and military facilities be evaluated and site parameters be established such that potential hazards from such routes and facilities will not pose undue risk to the type of facility proposed to be located at that site

### **2.2.3.4      *Technical Evaluation***

The staff reviewed the information presented in SSAR Section 2.2.3, pertaining to potential accidents as well as the applicant's responses to several RAIs, as discussed below. The staff's review confirmed that the information in the application addressed the required information relating to the evaluation of potential accidents.

The staff reviewed SSAR Sections 2.2.1 and 2.2.2 containing information related to industrial, military, and transportation facilities and routes to establish the presence and magnitude of potential external hazards that include accident categories, such as explosions, flammable vapor clouds (delayed ignition), toxic chemicals, fires, and airplane crashes addressed in SSAR Section 2.2.3.

#### **2.2.3.4.1      *Explosions and Flammable Vapor Clouds***

Explosions: The applicant considered hazards involving potential explosions resulting in blast overpressure as a result of detonation of explosives, munitions, chemicals, liquid fuels, and gaseous fuels that are processed, stored, used, or transported near the PSEG Site. The allowable and actual distances of potential hazardous explosive chemicals transported or stored are determined based on using 1 pound per square inch (psi) overpressure as a criterion for adversely affecting plant operation or preventing safe shutdown of the plant. In accordance with RG 1.91, peak positive incident overpressures below 1 psi are considered to cause no significant damage. The Salem and Hope Creek site chemicals, nearby facilities' chemicals, chemicals transported by vessel, and chemicals assumed to be transported by roadways near the PSEG Site are evaluated by the applicant. Hazardous materials potentially transported by a vessel on the Delaware River are identified in SSAR Table 2.2-16. Hazardous materials

transported on nearby roads or located at nearby facilities, or at the Salem and Hope Creek Generating Stations are identified in SSAR Table 2.2-17. The effects of limiting explosion events along with determined minimum safe distances are summarized in SSAR Table 2.2-18. Four bounding chemicals at the Salem and Hope Creek Generating Stations site identified for explosion analysis include a 22,712 liters (L) (6,000 gallons (gal)) tank of gasoline, the 30,283 L (8,000 gal) truck that refills the tank of gasoline, 3,785,411 L (1,000,000 gal) capacity tank of diesel fuel, and a bank of 3,398 cu. m (120,000 cu. ft) hydrogen cylinders. The results indicate that the calculated safe distances are less than the actual distance from the source to the safety-related building at the new plant. The staff notes that the hydrogen that the applicant considered in the analyses is not listed either in SSAR Table 2.2-2a or Table 2.2-2b, and is indicated as “facility wide” in SSAR Table 2.2-3 without any amount. Therefore, in RAI 52, Question 02.02.03-5, the staff requested that the applicant provide clarification about the hydrogen storage and assumptions and methodology used to calculate minimum safe distance. In a March 23, 2012, response, the applicant provided details and a revision to SSAR Table 2.2-3. Based on its review of the applicant’s response as well as the staff’s independent assessment, the staff considers the response reasonable and acceptable as it satisfies the guidance in NUREG-0800. The staff also confirmed that the applicant included its committed revision in SSAR Revision 1. Accordingly, the staff considers RAI 52, Question 02.02.03-5, resolved.

The only offsite chemicals identified are a tank of gasoline and a tank of propane at the Lower Alloways Creek Township Buildings over 4.8 km (3 mi) away. The minimum safe distances calculated are much less than the actual distance of 4.8 km (3 mi).

Two types of explosions are analyzed for vessels on the Delaware River, which include liquid or vapor explosions and solid explosions. Based on the largest chemical explosion and sinking of the Bow Mariner in 2004, the applicant estimated 116 tons of methyl tertiary-butyl ether (MTBE) vapor from 22 emptied tanks that were ignited by spark and exploded. The standoff distance calculated is 0.8 km (0.5 mi), which is less than the actual distance of 1.45 km (0.9 mi). Since MTBE is not listed in SSAR Table 2.2-6, in RAI 53, Question 02.02.03-2, the staff requested that the applicant clarify the relevance of this chemical vapor compared to the chemicals that are documented to be shipped during 2003–2007 on the Delaware River. Additionally, the staff requested that the applicant also provide an evaluation of the potentially limiting chemical among those transported on the Delaware River with a maximum carried transport amount of 4,545,455 kg (10,000,000 lbs, as the bounding case) in accordance with the guidance provided in RG 1.91. In a March 23, 2012, response, the applicant provided adequate information. Based on its review of the applicant’s response and an independent confirmatory calculation using RG 1.91 guidance, the staff concludes that the applicant’s approach is reasonable and acceptable as the calculated safe distance is less than the actual distance and meets the RG 1.91 criterion. The staff considers RAI 53, Question 02.02.03-2 resolved.

The smallest solid explosive mass that can have a 1 psi overpressure at a distance of 1.45 km (0.9 mi) is 589 tons. Based on historical large vessel explosions, on the order of estimated 2,500 tons of solid explosive is considered for the analysis. The staff noted that details pertaining to incident rates, spill rates, and explosion rates are not provided in SSAR Section 2.2.3.2.2. Therefore, in RAI 54, Question 02.02.03-3, the staff requested that the applicant provide details that were used in the probabilistic analysis of solid explosive hazards. In a March 7, 2012, response, the applicant provided detailed assumptions and methodology in calculating estimated allowable trips per year not to exceed  $1 \times 10^{-6}$  explosions per year. The applicant also provided a revision to SSAR Section 2.2.3.2.2. The staff confirmed that the

applicant's committed revision is included in SSAR Revision 1, Section 2.2.3.2.2. Based on its review of the applicant's response and further inclusion of the explosion probability of solid explosive materials in determining the total probability of all potential chemicals transported by vessel on the Delaware River, the staff finds the applicant's approach reasonable and acceptable as it satisfies the probability determination guidance specified in NUREG-0800, Section 2.2.3. Accordingly, the staff considers RAI 54, Question 02.02.03-3, resolved.

Flammable Vapor Clouds: (Delayed Ignition) Flammable gases in the liquid or gaseous state can form an unconfined vapor cloud that could drift toward the plant before ignition occurs, and then can burn or explode when the vapor concentration is within flammable range. For those chemicals with an identified flammability range, an air dispersion model based on the methods and equations in RG 1.78 and NUREG-0570, "Toxic Vapor Concentration in the Control Room Following a Postulated Accidental Release," is used to determine the distance that the vapor cloud can travel before the concentration is less than Lower Explosive Level (LEL). The analyzed effects of flammable vapor clouds and vapor cloud explosions from internal and external sources are summarized in SSAR Table 2.2-19.

Three bounding chemicals at the Salem and Hope Creek site that are analyzed include a 22,710 L (6,000 gal) tank of gasoline, the 30,280 L (8,000 gal) truck that refills the tank of gasoline, and a 3,396 cubic meter (cu. m.) (120,000 cubic feet (cu. ft.)) hydrogen tube farm. The applicant performed analysis of potential explosion impacts on the nearest safety-related building at the proposed plant, of gasoline storage tank at Hope Creek Generating Station, and also delivery of a gasoline truck to the storage tank. The results of the analysis indicate that the minimum safe distance from the gasoline storage tank and also the route of delivery tanker truck without exceeding an overpressure of 1 psi at the nearest safety-related building of the proposed plant is not met, specifically, the minimum allowable safe distance for the gasoline is greater than the actual distance from the tanks to the nearest postulated safety-related building at the proposed plant. The applicant stated that the Hope Creek Generating Station gasoline tank will be relocated for construction of the proposed plant, and the delivery truck route to the new tank will be analyzed for its effects on the proposed plant. Consistent with the applicant's stated commitment, the staff identified Permit Condition 2, described in Section 2.2.3.5 of this report, which addresses the safe distance to the nearest structures, systems, and components (SSCs) of the proposed plant, as it relates to compliance with an overpressure not to exceed 1 psi:

The safe distance for the hydrogen tanks is less than the actual distance. The safe distances determined for the offsite chemicals are much less than the nearby facilities distance of more than 4.8 km (3 mi) away.

Based on reports from the Maritime Exchange for the Delaware River and Bay (MEDRB), the USCG, and USACE, several chemicals are identified as the bounding chemicals that are transported along the Delaware River. These chemicals are propane, gasoline, benzene, alcohols (methanol, ethanol), carboxylic acids, ammonia, naphtha and solvents, methane, acetone and vinyl chloride. The closest point from which vessel traffic approaches the proposed new plant is 1.45 km (0.9 mi). A vapor cloud of alcohols has a standoff distance of less than 1.45 km (0.9 mile). The vessels transporting chemicals on the Delaware River that include propane, gasoline, benzene, ammonia, naphtha, acetone and vinyl chloride are analyzed using probabilistic analysis. In SSAR Table 2.2-6, the applicant identified the list of chemical commodities transported on the Delaware River between 2003 and 2007. Some of the chemicals and total amounts are different from the chemicals listed in SSAR Table 2.2-15 for

the probabilistic analyses of hazards due to chemicals transported on the Delaware River. Therefore, in RAI 51, Question 02.02.03-1, the staff requested that the applicant clarify the chemicals/data identified and evaluated in the hazard and probability evaluations. In a March 7, 2012, response, the applicant clarified how the chemicals and the amounts were accounted and considered in the probabilistic evaluations. The staff reviewed the response and finds that the applicant's assumptions are reasonable and acceptable as the applicant provided adequate clarifying information. Accordingly, the staff considers RAI 51, Question 02.02.03-1, resolved.

A probabilistic analysis, as discussed in SSAR Section 2.2.3.2.1, is used to determine the frequency of hazards due to chemicals transported on the Delaware River. The total allowable trips for the each of the chemical to have  $1 \times 10^{-6}$  hazards per year are identified in SSAR Table 2.2-14. The estimated trips of each chemical are shown in SSAR Table 2.2-15. The applicant concluded by stating, "For each chemical, the total number of allowable trips is greater than the estimated number of trips, and, therefore, none of these chemicals pose a threat greater than  $1 \times 10^{-6}$  per year." Based on the acceptance criteria of NUREG-0800, the staff considers that the aggregate probability of hazards should be determined, based on realistic data and assumptions, to be less than  $1 \times 10^{-6}$  per year, as opposed to the applicant's discrete individual chemical trips each having a probability of  $1 \times 10^{-6}$  or less per year. Therefore, in RAI 55, Question 02.02.03-4, the staff requested that the applicant revise the calculations to determine the total probability of explosive hazard from flammable vapor clouds due to all chemicals and solid explosives transported by vessels on the Delaware River. In an April 23, 2012, response, the applicant provided revised calculations for the total probability of  $2.31 \times 10^{-6}$  per year. Since the estimated total probability is greater than the NUREG-0800 acceptance criterion of  $1 \times 10^{-6}$  per year, the applicant determined the core damage frequency (CDF) of  $7.35 \times 10^{-9}$  per year using the highest estimated conditional core damage probability (CCDP)  $3.18 \times 10^{-3}$ , which is documented for the Advanced Boiling Water Reactor (ABWR) technology aircraft hazard event. The applicant also provided revisions to SSAR Section 2.2.3 as well as SSAR Tables 2.2-14 and 2.2-15, and committed to incorporate the same changes in the next revision of the SSAR. Based on its review of the response as well as independent assessment of total probability, the staff considers the applicant's assumptions and conclusion reasonable and acceptable as the analysis satisfies the NRC guidance in NUREG-0800. The staff confirmed that the applicant's committed revisions were included in the SSAR Revision 1. Accordingly, the staff considers RAI 55, Question 02.02.03-4, resolved.

In a July 17, 2012, response to RAI 50, Question 02.02.01-02.02.02-1, item (5), the applicant examined the potential threat posed by vessels occupying anchorages on the Delaware River near the PSEG Site. General Anchorage 2 and General Anchorage 3 are within 8 km (5 mi) of the PSEG Site. The applicant calculated the frequency of hazardous conditions at the PSEG Site due to vessels anchored in Anchorage 2 as  $8.6 \times 10^{-10}$  per year and due to vessels anchored in Anchorage 3 as  $1.1 \times 10^{-9}$  per year. Based on its review of the applicant's response containing assumptions and calculations, the staff considers the response reasonable and acceptable, as it satisfies the NUREG-0800 acceptance criteria associated with the regulatory requirements mentioned above. The applicant also provided revisions to SSAR Sections 2.2.2.3.2, 2.2.3.2.2, and 2.2.3.2.3. The staff confirmed that in Revision 3 of the ESP application, dated March 31, 2014, the applicant correctly incorporated the changes in SSAR Sections 2.2.2.3.2, and 2.2.3.2.2, but not in 2.2.3.2.3. The staff informed the applicant about the inconsistency and identified this as **Confirmatory Item 2.2-1**.

#### 2.2.3.4.2 Toxic Chemicals

Toxic chemicals hazards are considered for facilities and activities in the vicinity of the PSEG Site. These hazards include chemicals processed, stored, used, or transported near the PSEG Site. However, the control room habitability is not evaluated for this ESP application as PSEG has not selected a reactor design technology, and the control room characteristics are unknown. Therefore, chemicals that lead to concentration above the Immediately Dangerous to Life and Health (IDLH) at the power block boundary will be evaluated at the COL stage. The staff has identified this as **COL Action Item 2.2-1**, as described in Section 2.2.3.5 of this report.

Hazardous materials potentially on the Delaware River are identified in SSAR Table 2.2-16, and those transported on nearby roads or at nearby facilities are identified in SSAR Table 2.2-17. Only those chemicals at nearby facilities were evaluated by the applicant, and the applicant found this to not impact the PSEG Site. All other chemicals will be evaluated at the COL stage.

As described in SSAR Section 2.2.3.2, onsite chemical storage for the proposed new plant is not included in the PSEG ESP application, and will be evaluated at the COL stage, when the new plant reactor technology is selected. The staff has identified this as **COL Action Item 2.2-2**, as described in Section 2.2.3.5 of this report.

#### 2.2.3.4.3 Fires

Hazards leading to high heat fluxes, smoke, nonflammable gases, or chemical bearing clouds from the release of materials as consequence of fires in the vicinity of the plant are considered. The chemical releases analyzed for potentially leading to high heat fluxes at safety-related buildings are as follows:

- a hydrogen tank jet fire from the tank farm on the Hope Creek site; a gasoline pool fire due to a spill of the Hope Creek delivery truck; a diesel pool fire due to a spill of the Hope Creek tank
- a boiling liquid expanding vapor explosion (BLEVE) fireball of the propane tank at the LAC Township Buildings; a pool fire from the spill of gasoline from a vessel on the Delaware River
- a BLEVE fireball of a propane vessel on the Delaware River

The results are summarized in SSAR Table 2.2-21. Based on the results of these analyses, the applicant concluded that none of the fires is hazardous to the new plant. The staff's confirmatory assessments confirm the applicant's conclusion that the potential heat rate from these fires would not adversely impact the closest SSC of the proposed plant.

#### 2.2.3.4.4 Collisions with Intake Structure

The cooling water intake structure for the proposed new plant is located on the Delaware River, which is a navigable waterway. Therefore, a probability evaluation of an accident involving a runaway barge carrying flammable material that could cause a significant release resulting in fire or explosion upon striking the intake structure was performed. The probability was determined to be  $0.59 \times 10^{-7}$  per year, which is smaller by an order of magnitude than the NUREG-0800 acceptance criterion of  $1 \times 10^{-7}$  per year. The staff reviewed the

applicant-considered factors in determining this probability and finds the applicant's approach and methodology reasonable and acceptable.

#### **2.2.3.4.5 Liquid Spills**

One of the reactor technologies being proposed by PSEG requires a safety-related structure on the Delaware River. The materials listed in SSAR Table 2.2-6 are those that are transported on the Delaware River and could potentially be spilled into the waterway. Other than coal, tar-like oil, and asphalt, having specific gravity less than 1, would float on the surface of the water, and would not dilute, and, therefore, are not likely to be drawn into the intake system. In the unlikely event of a spill of coal, tar-like oil, or asphalt into the Delaware River, these substances would be removed by the bar rack or traveling screen in the intake system. As a result, the unlikely event of a liquid spill would not impact the safe operation of the new plant.

#### **2.2.3.4.6 Radiological Hazards**

In SSAR Section 2.2.3.5, the applicant stated that the control-room shielding design and habitability systems for the new plant are capable of maintaining the main control room environment suitable for prolonged occupancy throughout the duration of the postulated accidents that require protection from external airborne radioactivity. Therefore, the applicant maintains that potential hazards due to the release of radioactive material from Hope Creek Generating Station or Salem Generating Station as a result of normal operations or an unanticipated event would not threaten the safety of the new plant.

#### **2.2.3.5 *Permit Condition and COL Action Items***

- Permit Condition 2: A COL applicant referencing this early site permit shall demonstrate that the nearest structures, systems, and components (SSCs) important to safety of the selected plant design can withstand the effects of potential explosions associated with the relocated gasoline storage tank and the gasoline delivery tanker truck. The applicant shall demonstrate this by using the methodologies provided in RG 1.91 and RG 1.78 for direct explosion and vapor cloud explosion, respectively, to confirm that a minimum safe distance exists between the nearest plant SSCs important to safety and the relocated gasoline storage tank and the gasoline delivery tanker truck such that the SSCs would not experience an overpressure in excess of 1.0 psi in the event of an explosion.
- COL Action Item 2.2-1: A COL applicant referencing this early site permit will, after selecting a reactor technology, evaluate the impact on the proposed plant at the PSEG Site of toxic chemicals processed, stored, used, or transported within the vicinity of the PSEG Site, to identify chemicals that lead to concentration above the Immediately Dangerous to Life and Health (IDLH) at the power block boundary, and provide a detailed control room habitability assessment.
- COL Action Item 2.2-2: A COL applicant referencing this early site permit will, after selecting a reactor technology, identify potentially toxic, flammable, or explosive hazardous materials to be stored onsite, and evaluate their possible impact on the proposed plant at the PSEG Site.

### **2.2.3.6      *Conclusion***

Based on the aforementioned discussions, along with the inclusion of the COL Action Items 2.2-1 and 2.2-2, and subject to Permit Condition 2 and resolution of Confirmatory Item 2.2-1, the staff finds that the PSEG ESP applicant has identified and evaluated potential accidents related to the presence of hazardous materials or activities in the PSEG Site vicinity that could affect a nuclear power plant or plants that might be constructed on the proposed site. The staff notes that from these potential accidents, the applicant has selected those that should be considered design-basis events at the COL stage. The staff reviewed the information provided and, for the reasons discussed above, along with the inclusion of the COL Action Items and subject to Permit Condition 2, concludes that the PSEG ESP applicant has established site characteristics and design parameters acceptable to meet the requirements of 10 CFR 52.17(a)(1)(vii), 10 CFR 52.17(a)(1)(ix), 10 CFR 100.20(b), and 10 CFR 100.21(e) for determining the acceptability of the PSEG Site.