Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

December 18, 2008
U7-C-STP-NRC-080072

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Requests for Additional Information

Attached are responses to NRC staff questions included in Request for Additional Information (RAI) letter numbers 68, 69, 70, 71, 72 and 73, related to Combined License Application (COLA) FSAR Sections 2.3S.1, 2.3S.2, 2.3S.3, 2.3S.5, and 12.2. Attachments 1 through 14 include responses to the RAI questions listed below, which comprise complete responses to RAI letter numbers 68, 69, 70, 71, 72 and 73:

02.03.01-14	02.03.02-5	02.03.03-6	02.03.05-8	12.02-1
02.03.01-15	02.03.02-6		02.03.05-9	
02.03.01-16			02.03.05-10	
02.03.01-17				
02.03.01-18				
02.03.01-19				
02.03.01-20				

When a change to the COLA is indicated, the change will be incorporated into the next routine revision of the COLA following NRC acceptance of the RAI response.

There are no commitments in this letter.

If you have any questions regarding these responses, please contact me at (361) 972-7136, or Bill Mookhoek at (361) 972-7274.

STI 32413711 D091 NRO

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 12/18/08

Scott Head
Manager, Regulatory Affairs
South Texas Project Units 3 & 4

rhb

Attachments:

1. Question 02.03.01-14
2. Question 02.03.01-15
3. Question 02.03.01-16
4. Question 02.03.01-17
5. Question 02.03.01-18
6. Question 02.03.01-19
7. Question 02.03.01-20
8. Question 02.03.02-5
9. Question 02.03.02-6
10. Question 02.03.03-6
11. Question 02.03.05-8
12. Question 02.03.05-9
13. Question 02.03.05-10
14. Question 12.02-1

cc: w/o attachment except*
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RAI 02.03.01-14:

QUESTION:

Revise FSAR Section 2.3S.1 to identify the normal winter precipitation event, the extreme frozen winter precipitation event, and extreme liquid winter precipitation event as site characteristics in accordance with the Proposed Interim Staff Guidance (ISG) DC/COL-ISG-07, "Interim Staff Guidance on Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures" (ML081990438), or justify an alternative approach. Provide a basis discussion in FSAR Section 2.3S.1 for the chosen site characteristic values.

RESPONSE:

In accordance with the Proposed Interim Staff Guidance (ISG) DC/COL-ISG-07 (Reference 1) on the assessment of normal and extreme winter precipitation loads on the roofs of Seismic Category I structures, the normal winter precipitation, the extreme frozen winter precipitation and extreme liquid winter precipitation events are determined below:

Reference 1, Proposed Interim Staff Guidance, Section 1 (a) states: The normal winter precipitation event should be the highest ground-level weight (in lb/ft^2) among (1) the 100-year return period snowpack, (2) the historical maximum snowpack, (3) the 100-year return period snowfall event, or (4) the historical maximum snowfall event in the site region.

Based on the National Climatic Data Center (NCDC) Snow Climatology database, the historical maximum snowfall event in the site region was 10.5" at the Danevang 1 W station on December 25, 2004 (Reference 2). Due to surface temperatures in the STP site region, snow does not accumulate into snowpack. As discussed in FSAR Section 2.3S.1.3.4, based on ASCE/SEI 07-02, the 100-year return period ground-level snow load for the STP 3 & 4 site is 0 kPa (0 psf). The snow load provisions in ASCE/SEI 07-02 were developed from an extreme-value statistical analysis of weather records of snow on the ground. ASCE/SEI 7-05 reports the same snow load value for the STP site of 0 kPa (0 psf). Therefore the normal winter precipitation event is: (4) the historical maximum snowfall event in the site region of 10.5".

Reference 1, Proposed Interim Staff Guidance, Section 1 (b) states: The extreme frozen winter precipitation event should be the higher ground-level weight (in lb/ft^2) between (1) the 100-year return period snowfall event and (2) the historical maximum snowfall event in the site region.

Based on the NCDC Snow Climatology database, the historical maximum snowfall event in the site region was 10.5" at the Danevang 1 W station. Therefore, the normal winter precipitation event and the extreme frozen winter precipitation event are both the ground-level weight of the historical maximum snowfall event. To convert the historical maximum snowfall into a snow load, the following formula was used:

$$L = S \times 5.2$$

Where:

- S is the liquid equivalent (in inches) associated with the maximum snowfall event. Reference 2 presents the observed snowfall at Danevang 1 W station (12/25/2004) of 10.5" and the observed equivalent liquid precipitation of 1.05".
- 5.2 is the weight of one inch of water in lb/ft^2

Thus, the weight of the extreme frozen winter precipitation would be

$$L = 1.05 \times 5.2 = 5.5 \text{ lb/ft}^2$$

Reference 1, Proposed Interim Staff Guidance, Section 1 (c) states: The extreme liquid winter precipitation event is defined as the theoretically greatest depth of precipitation (in inches of water) for a 48-hour period that is physically possible over a 25.9-square-kilometer (10-square-mile) area at a particular geographical location during those months with the historically highest snowpacks.

The extreme liquid water precipitation [Probable Maximum Winter Precipitation (PMWP)] event at the STP site was determined to be 34.0 inches. The 48-hour PMWP event is derived through logarithmic interpolation of the 48-hour precipitation value from the 6-hr, 24-hr, and 72-hr PMWP values in Reference 3.

FSAR Section 2.3S.1.3.4 (beginning of 7th paragraph) will be revised as shown below:

~~Estimating the design basis snow load on the roofs of safety-related structures~~ Assessing normal and extreme winter precipitation loads on the roofs of seismic category I structures considers ~~both of~~ these climate-related components:

- The normal winter precipitation event, which is defined as the highest ground-level weight (in lb/ft^2) among (1) the 100-year return period snowpack, (2) the historical maximum snowpack, (3) the 100-year return period snowfall event, or (4) the historical maximum snowfall event in the site region.
- The extreme frozen winter precipitation event, which is defined as the higher ground-level weight (in lb/ft^2) between (1) the 100-year return period snowfall event and (2) the historical maximum snowfall event in the site region.
- The extreme liquid winter precipitation event, which is defined as the theoretically greatest depth of precipitation (in inches of water) for a 48-hour period that is physically possible over a 25.9-square-kilometer (10-square-mile) area at a particular geographical location during those months with the historically highest snowpacks.
- ~~The weight of the 100-year return period ground-level snowpack (to be included in the combination of normal live loads)~~

- ~~The weight of the 48-hour probable maximum winter precipitation (PMWP) (to be included, along with the weight of the 100-year return period ground-level snowpack, in the combination of extreme live loads)~~

From a probabilistic standpoint, the estimated weight of the 100-year return period ground-level snowpack for the STP site area is 0 lb/ft, as determined in accordance with the guidance in Section C7.0 of the ASCE-SEI design standard, "Minimum Design Loads for Buildings and Other Structures" (Reference 2.3S-10).

Due to temperatures at the surface, the site region is not favorable for snowpack accumulation. In addition, there are not enough available snow observations to calculate a 100-year return snowfall. Therefore, the weight of the historic maximum snowfall event, 10.5 inches at the Danevang 1 W station (Table 2.3S-3), would represent both the normal winter precipitation event and the extreme frozen winter precipitation event. To convert the historical maximum snowfall into a snow load, the following formula was used:

$$L = S \times 5.2$$

Where:

- S is the liquid equivalent (in inches) associated with the maximum snowfall event. Reference 2 presents the observed snowfall at Danevang 1 W station (12/25/2004) of 10.5" and the observed equivalent liquid precipitation of 1.05".
- 5.2 is the weight of one inch of water in lb/ft^2.

Thus, the weight of the normal winter precipitation and extreme frozen winter precipitation would both be

$$L = 1.05 \text{ x } 5.2 = 5.5 \text{ lb/ft}^2$$

~~Considering that the station records for snowfall, summarized in Table 2.3S-3, occur on only eight dates over a period of record of more than 60 years and, more importantly, considering the snowfall totals for those events and that they did not appear to persist for any appreciable period of time as ground-level snowpack, determination of the 48-hour PMWP value or evaluation of normal or extreme live snow loads on the roofs of safety-related structures does not appear to be warranted for STP 3 & 4.~~

The extreme liquid water precipitation [Probable Maximum Winter Precipitation (PMWP)] event at the STP site was determined to be 34.0 inches. The 48-hour PMWP event is derived through logarithmic interpolation of the 48-hour precipitation value from the 6-hr, 24-hr, and 72-hr PMWP values in Hydrometeorological Report No. 53 (Reference 2.3S-11).

References:

1. Nuclear Regulatory Commission, Office of New Reactors, Proposed Interim Staff Guidance (ISG) DC/COL-ISG-07, "Interim Staff Guidance on Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures," issued for comment August 15, 2008.

2. "U.S. Summary of Day Climate Data (DS 3200/3210), POR 2002-2005," NCDC, CD-ROM, NOAA, July 2006. (FSAR Reference 2.3S-5)

3. "Seasonal Variation of 10-Square Mile Probable Maximum Precipitation Estimates, United States East of the 105th Meridian," NRC, NUREG/CR-1486, Hydrometeorological Report No. 53, June 1980. (FSAR Reference 2.3S-11)

RAI 02.03.01-15:

QUESTION:

Explain the meteorological phenomena associated with the STP site cyclical precipitation pattern and revise FSAR Section 2.3S.1.2 as necessary.

FSAR Section 2.3S.1.2 describes a cyclical precipitation pattern with a predominant maximum occurring from late spring into early summer and a secondary maximum period from early to mid-autumn. This FSAR section further states that the late spring/early summer predominant precipitation maximum is associated with both tropical cyclones and thunderstorm activity whereas the early to mid autumn secondary precipitation maximum is primarily due to thunderstorms. Don't tropical cyclones occur more frequently in early to mid autumn as compared to late spring/early summer? FSAR Section 2.3S.1.3.3 states the highest monthly frequency of tropical cyclones is recorded in September.

RESPONSE:

The tropical cyclone inventory, reviewed on April 20, 2007, from NOAA's Coastal Service Center (CSC) historical database (1851-2006, 155 years) shows that 15 of 76 tropical cyclones occurred during the month of June, 14 in July, 19 in August, 22 in September, and 6 in October. Almost 40% of the storms in the search centered on STP occurred in June and July, which is before the period when the Atlantic has begun to climatologically peak in late August, September and early October.

In a separate question, the NRC staff had found 75 storm tracks for the STP search. This could be due to the alternate methods by which tracks can be queried in the CSC database. The original analysis queried tracks (76) within 100 nautical miles at the center of zip code 77440. Additionally, continual updates in the NOAA CSC database can alter the track count depending on the date of the analysis.

The seventh paragraph of FSAR Subsection 2.3S.1.2 will be revised as follows, to remove the reference to parent phenomena from the general climatology section (2.3S1.2). Extreme events, like hurricanes, do not have much of an impact on climatic means, as they are relatively infrequent. The impact is better reflected by the discussion in Subsections 2.3S.1.3.3 (Tropical Cyclones) and 2.3S.1.3.4 (Precipitation Extremes).

> Monthly precipitation exhibits a cyclical pattern, with the predominant maximum occurring ~~from late spring into early summer~~ in May with 5.12 inches, and a secondary maximum ~~period in from early to mid-autumn~~ September with 5.00 inches (see Table 2.3S-2). ~~The late spring/early summer maximum in precipitation is primarily associated with thunderstorms. Thunderstorm activity continues to occur through the autumn. Tropical cyclone occurrences are observed in the region starting in June through October. Both phenomena are responsible for the secondary precipitation maximum in the autumn. The late spring/early summer maximum is associated with both tropical~~

~~cyclones (as discussed in Subsection 2.3S.1.3.3) and thunderstorm activity; the early to mid-autumn secondary maximum is primarily due to thunderstorms.~~ Because the STP site is located close enough to the Gulf of Mexico (the distance, midpoint between Units 3 & 4 reactor buildings, is 14.67 miles), the strong winds associated with tropical cyclones can have a significant effect on the site area.

RAI 02.03.01-16:

QUESTION:

Confirm the number of tropical cyclone storm tracks that have passed near the STP site and revise FSAR Section 2.3S.1.3.3 as necessary.

FSAR Section 2.3S.1.3.3 discusses the frequency of tropical cyclone storm tracks that have been recorded in the vicinity of the STP site. This FSAR section states that NOAA's Coastal Service Center (CSC) historical hurricane track database indicates that a total of 142 tropical cyclone storm tracks have passed within a 100-nautical mile (nm) radius of the STP site from 1851 through 2006. In reviewing the same database, the staff found that 75 (instead of 142) storm tracks passed within a 100-nm radius. The staff believes that a number of these storm tracks are assigned a multiple number of storm intensities as the storms moved through the STP site region which were misclassified as separate storm tracks by the applicant.

RESPONSE:

For the initial STP COLA, a tropical cyclone inventory was taken for the development of FSAR Section 2.3S.1.3.3. After re-counting the original tropical cyclone inventory, taken on April 20, 2007, from NOAA's Coastal Service Center (CSC), it was confirmed that there are 76 separate tropical cyclone tracks within the 100-nm radius of the STP site. The NRC staff counted 75 storm tracks and this could be due to the alternate methods by which tracks can be queried. The revised STP analysis queried tracks (76) within 100 nautical miles at the center of zip code 77440. Additionally, continual updates in the NOAA CSC database can alter the track count depending on the date of the analysis.

The second, third and fourth paragraphs of FSAR Section 2.3S.1.3.3 will be revised as follows:

> National Oceanic and Atmospheric Administration's (NOAA) Coastal Services Center provides a comprehensive historical database, extending from 1851 through 2006, of tropical cyclone tracks based on information compiled by the National Hurricane Center. This database indicates that a total of ~~142~~ 76 tropical cyclone centers or storm tracks have passed within a 100-nautical-mile radius of the STP 3 & 4 site during this historical period (Reference 2.3S-12). Storm classifications and respective frequencies of occurrence over this 155-year period of record are as follows:
>
> - Hurricanes – Category 5 (1), Category 4 (~~7~~ 6), Category 3 (~~9~~ 4), Category 2 (~~12~~ 5), Category 1 (~~31~~ 22)
> - Tropical storms – ~~62~~ 35
> - Tropical depressions – ~~18~~ 3
> - Subtropical storms – 0
> - Subtropical depressions – ~~1~~ 0
> - Extra-tropical storms – ~~1~~ 0

Tropical cyclones within this 100-nautical-mile radius have occurred as early as June and as late as October, with the highest frequency (~~45~~ 22 out of ~~142~~ 76 events) recorded during September. August accounts for ~~41~~ 19 events, indicating that almost ~~61%~~ 54% of the tropical cyclones that affect the site area occur from late summer to early autumn. Frequencies during the months of June and July are approximately equal to one another but approximately ~~45%~~ 30% lower than during the peak months of September and August; intensity levels are lower as well.

Hurricanes of all categories have passed within 100 nautical miles of the site during the month of September; ~~10~~ 6 of these ~~19~~ 10 occurrences were classified as Category 1 storms. The only Category 5 storm track within this radial distance was Hurricane Carla in September 1961. ~~Twenty-two~~ Twelve hurricanes have been recorded within 100 nautical miles of the site during August. While none of these reached Category 5 status, the distribution of other hurricane classifications indicates August as having higher intensities on a long-term climatological basis - that is, Category 4 (4), Category 3 (~~5~~ 2), Category 2 (~~5~~ 2), and Category 1 (~~8~~ 4).

RAI 02.03.01-17:

QUESTION:

Confirm some of the data statistics presented in FSAR Table 2.3S-3 and revise as necessary. FSAR Table 2.3S-3 presents climatological extremes at selected National Weather Service and cooperative observing stations in the STP site area. The staff reviewed the maximum and minimum temperature statistics provided in FSAR Table 2.3S-3 against the NCDC's Climate Data Online (CDO) Surface Data, Monthly (SDM) and found the following discrepancies:

(a) For Edna Hwy 59 Bridge maximum temperature, FSAR Table 2.3S-3 reports that measurements were not made whereas the NCDC SDM reports a value of 105°F for 08/12/1969.

(b) For Edna Hwy 59 Bridge minimum temperature, FSAR Table 2.3S-3 reports that measurements were not made whereas the NCDC SDM reports a value of 17°F for 01/12/1973.

RESPONSE:

The Edna Hwy 59 Bridge maximum temperature (10th station row 1st data column) of Table 2.3S-3 will be revised to 105°F. The changes to Table 2.3S-3 are provided in the response to RAI 02.03.01-18.

The Edna Hwy 59 Bridge minimum temperature (10th station row 2nd column) of Table 2.3S-3 will be revised to 17°F. The changes to Table 2.3S-3 are provided in the response to RAI 02.03.01-18.

RAI 02.03.01-18:

QUESTION:

Confirm some of the data statistics presented in FSAR Table 2.3S-3 and revise as necessary. FSAR Table 2.3S-3 presents climatological extremes at selected National Weather Service and cooperative observing stations in the STP site area. The staff reviewed the maximum 24-hour and maximum monthly rainfall statistics provided in FSAR Table 2.3S-3 against the NCDC's Climate Data Online (CDO) Surface Data, Monthly (SDM) and found the following discrepancies:

(a) For the Palacios Muni Airport maximum monthly rainfall, FSAR Table 2.3S-3 reports a value of 24.30 inches for 10/1949 whereas the NDCD SDM reports a value of 24.28 inches for 10/1949.

(b) For the Bay City Waterworks maximum 24-hour rainfall, FSAR Table 2.3S-3 reports a value of 8.95 inches on 09/12/1961 whereas the NCDC SDM reports a value of 20.85 inches on 10/19/1983.

(c) For the Bay City Waterworks maximum monthly rainfall, FSAR Table 2.3S-3 reports a value of 23.73 for 10/1984 whereas the NCDC SDM reports a value of 24.02 for 10/1983.

(d) For the Pierce 1E maximum monthly rainfall, FSAR Table 2.3S-3 reports a value of 17.22 inches for 10/1949 whereas the NCDC SDM reports a value of 23.37 inches for 11/2004.

(e) For the Port O'Connor maximum monthly rainfall, FSAR Table 2.3S-3 reports a value of 34.44 inches for 07/2006 whereas the NCDC SDM reports a value of 24.51 inches for 10/1984.

(f) For Wharton maximum 24-hour rainfall, FSAR Table 2.3S-3 reports that measurements were not made whereas the NCDC SDM reports a value of 11.58 inches for 10/18/1994.

(g) For Wharton maximum monthly rainfall, FSAR Table 2.3S-3 reports that measurements were not made whereas the NCDC SDM reports a value of 20.06 inches for 11/2004.

RESPONSE:

Table 2.3S-3 will be updated to reflect the climatological extremes from the NCDC SDM and SDD reports as discussed in RAIs 02.03.01-17, 02.03.01-18, and 02.03.01-19. The changes for the rainfall data to address RAI 02.03.01-18 are itemized below.

(a) The 2nd station row 4th data column of Table 2.3S-3 will be revised in response to RAI 02.03.01-18; 24.28 instead of 24.30.

(b) The 3rd station row 3rd data column of Table 2.3S-3 will be revised in response to RAI 02.03.01-18; to 20.85 rather than 8.95.

(c) The 3rd station 4th data column of Table 2.3S-3 will be revised in response to RAI 02.03.01-18; to 24.02 rather than 23.73.

(d) The 6th station row 4th data column of Table 2.3S-3 will be revised in response to RAI 02.03.01-18; to 23.37, rather than 17.22.

(e) The 8th station row 4th data column of Table 2.3S-3 will be revised in response to RAI 02.03.01-18; to 24.51 rather than 34.44.

(f) The 9th station row 3rd data column of Table 2.3S-3 will be revised in response to RAI 02.03.01-18; to 11.58 rather than NA.

(g) The 9th station row 4th data column of Table 2.3S-3 will be revised in response to RAI 02.03.01-18; to 20.06 rather than NA.

Table 2.3S-3 Climatological Extremes at Selected NWS and Cooperative Observing Stations in the STP 3 &4 Site Area

Station	Maximum Temperature (°F)	Minimum Temperature (°F)	Max 24-Hr Rainfall (inches)	Max Monthly Rainfall (inches)	Max 24-Hr Snowfall (inches)	Max Monthly Snowfall (inches)
Matagorda 2	104 [a] (09/06/00)	9 [a] (12/23/89)	15.71 [a] (05/01/11)	20.75 [a] (10/86)	5.0 [c] (12/25/04)	5.0 [c] (12/04)
Palacios Muni Airport	107 [a] (09/05/00)	9 [a] (12/23/89)	9.65 [a] (05/07/51)	~~24.30 [b, d] (10/49)~~ 24.28 (10/49) [l]	4.0 [b, d] (02/12/58)	4.0 [b, d] (02/58)
Bay City Waterworks	109 [a, b] (09/06/00) [g]	7 [a, b] (12/24/89) [h]	~~8.95 [a] (09/12/61)~~ 20.85 (10/19/83) [l]	~~23.73 [a] (10/84)~~ 24.02 (10/83) [l]	3.8 [b, d] (02/12/58)	3.8 [b, d] (02/58)
Danevang 1W	109[a,b] (09/06/00) [i]	7 [a] (01/23/40)	12.96 [a] (06/26/60)	24.01 [b, d] (08/45)	~~10.5 [c] (12/23/04)~~ 10.5 [c] (12/25/04)	10.5 [c] (12/04)
Maurbro	107[b,d] (07/27/54)	8 [b,d] (01/31/49)	14.80 [b, d] (06/26/60)	22.47 [b, d] (06/60)	4.0 [b,d] (02/13/60)	4.0 [b, d] (02/60)
Pierce 1E	112[a] (09/05/00)	4 [a] (01/31/49)	8.85 [a] (11/02/43)	~~17.22 [b, d] (10/49) [j]~~ 23.37 (11/04) [l]	8.0 b, [d] (02/13/60)	8.0 [b, d] (02/60)

Table 2.3S-3 Climatological Extremes at Selected NWS and Cooperative Observing Stations in the STP 3 &4 Site Area (Continued)

Station	Maximum Temperature (°F)	Minimum Temperature (°F)	Max 24-Hr Rainfall (inches)	Max Monthly Rainfall (inches)	Max 24-Hr Snowfall (inches)	Max Monthly Snowfall (inches)
Point Comfort	107 [a] (09/06/00)	9 [a] (12/23/89)	14.65 [a] (06/26/60)	25.24 [b, d] (06/60)	Trace [a] (11/28/76)	Trace [a] (11/76)
Port O'Connor	105 [a] (09/06/00)	10 [a] (12/23/89)	12.50 [a] (07/10/76)	~~34.44 d, [e] (07/06)~~ 24.51 (10/84) [l]	1.3 [a] (02/09/73)	1.3 [a] (02/73)
Wharton	NA [f]	NA [f]	~~NA [f]~~ 11.58 (10/18/94) [l]	~~NA [f]~~ 20.06 (11/04) [l]	7.0 [b, d] (02/13/60)	7.0 [b, d] (02/60)
Edna Hwy 59 Bridge	~~NA [f]~~ 105 [l] 8/12/69	~~NA [f]~~ 17 [l] 01/12/73	17.58 [b, d] (10/18/94)	20.97 [b, d] (10/94)	NA [f]	NA [f]
Freeport 2NW	105 [a, b] (09/06/00) [g]	13 [a] (12/26/83)	16.72 [a] (07/26/79)	31.61 [a] (09/79)	2.0 [b, d] (02/12/58)	3.0 [b, d] (01/40)
Angleton 2W	107 [a] (09/05/00)	7 [a, b] (12/24/89) [h]	14.36 [a] (07/26/79)	22.13 [a] (07/79)	3.0 [b, d] (01/22/40)	3.0 [b, d] (01/40)
Victoria Regional Airport	111 [a] (09/05/00)	9 [a] (12/23/89)	9.87 [a] (04/05/91)	19.05 [a] (09/78)	~~2.1 [a] (01/12/85)~~ 3.3 [m] (02/12/58)	~~2.1 [a] (01/85)~~ 3.4 [l] (02/58)
Thompsons 3WSW	106 [c] (07/07/05)	8 [a] (12/23/89)	9.53 [a] (09/19/83)	18.15 [b,d] (06/60)	1.5 [a, b, d] (02/09/73) [~~k~~ j]	1.5 [a, b, d] (02/73) [~~k~~ j]
Aransas Wildlife Refuge	102 [a, b] (09/06/00) [~~i~~ k]	9 [a] (12/23/89)	14.25 [a] (11/01/74)	19.08 [a] (09/79)	5.5 [c] (12/25/04)	5.5 [c] (12/04)

Notes:

[a] Reference 2.3S-2
[b] Reference 2.3S-4
[c] Reference 2.3S-5
[d] Reference 2.3S-3
[e] Reference 2.3S-21
[f] NA = Measurements not made at this station
[g] Occurs on multiple dates: 09/04/00; 09/06/00 (most recent date shown in table)
[h] Occurs on multiple dates: 12/23/89; 12/24/89 (most recent date shown in table)
[i] Occurs on multiple dates: 09/05/00; 09/06/00 (most recent date shown in table)

~~[j] Incomplete total of 23.37 inches of rain reported for month of November 2004 (up to six days observations missing)~~

[~~k~~ j] Occurs on multiple dates: 02/13/60; 02/09/73 (most recent date and/or month shown in table)

[~~l~~ k] Occurs on multiple dates: 05/03/84; 05/04/84; 09/06/00 (most recent date shown in table)

[l] Reference 2.3S-XXl

[m] Reference 2.3S-XXm

The last paragraph of Section 2.3S.1.3.3 will be revised to reflect the changes made in Table 2.3S-3 and to remove the association being made between monthly rainfall amounts and tropical cyclones which is not clear from the Table 2.3S-3 and references cited.

~~Nearly~~ Only one-third of the individual NWS station 24-hour rainfall records ~~and nearly two-thirds of the monthly record totals~~ were established as a result of precipitation associated with tropical cyclones that passed within a 100-nautical-mile radius of the STP site. ~~For example, as shown in Table 2.3S-3, the maximum 24-hour rainfall event for Bay City Waterworks (8.95 inches) occurred on September 12, 1961 as a result of Hurricane Carla (References 2.3S-2 and 2.3S-4). In addition, more than 16 inches of rain was reported from Bay City, Texas, northeast to Galveston, Texas, for Hurricane Carla the same hurricane (References 2.3S-2 and 2.3S-4). Also, i~~ In July 1979, tropical depression Claudette set 24-hour rainfall records at Freeport 2 NW (16.72 inches.) and Angleton 2 W (14.36 inches) cooperative weather stations (Reference 2.3S-2). In June 1960, a tropical depression that had not been named set 24-hour rainfall records at Danevang 1W (12.96 inches), Maurbro (14.80 inches) and Point Comfort (14.65 inches) cooperative weather stations (Reference 2.3S-2).

The second paragraph in Section 2.3S.1.3.4 will be removed as it is a redundant statement to the last paragraph in Section 2.3S.1.3.3. The third and fourth paragraphs in Section 2.3S.1.3.4 will be revised to reflect the changes made in Table 2.3S-3.

~~As indicated in Subsection 2.3S.1.3.3, nearly one-third of the individual weather station 24-hour rainfall records and nearly two-thirds of the monthly total records were established as a result of precipitation associated with tropical cyclones that passed within a 100-nautical-mile radius of the STP site.~~

~~However, t~~The highest 24-hour rainfall total in the site area, ~~17.58~~ 20.85 inches, on ~~October 18, 1994~~ October 19, 1983, at the ~~Edna Highway 59 Bridge~~ Bay City Waterworks cooperative weather observing station (References 2.3S-XXl ~~and 2.3S-20~~), approximately ~~40~~ 13 miles ~~WNW~~ NNE of the STP site, was not associated with a tropical cyclone originating in or passing through the Gulf of Mexico. ~~Rather, t~~This extreme rainfall event was one of many over southeast Texas caused by a synoptic situation that included a steady stream of tropical moisture into the region, ~~in the wake of former Pacific Hurricane Rosa (which had crossed into Mexico, moved through Texas, and slowed after entering the Mississippi Valley),~~ and a ~~quasi-stationary~~ slow-moving frontal

boundary ~~along the Texas Coast~~ that provided a source of ~~instability~~ lift and supported widespread and continual thunderstorm development (Reference 2.3S-~~15~~XXn).

~~Similarly, t~~ The highest monthly rainfall total for the site area, ~~34.44~~ 31.61 inches during ~~July 2006~~ September 1979 was recorded at the ~~Port O'Connor~~ Freeport 2NW cooperative observing station, located approximately ~~34 miles SW~~ 43 miles ENE of the STP site. ~~This total represents the accumulation of 15 days of measurable precipitation during that month, with less than 20% being recorded from July 1 to 7, and the period from July 22 to 29 accounting for approximately 80% of the total. Over 24 inches fell in a period of only four days between July 23 and July 26 (References 2.3S-20, and 2.3S-21). In general, when monthly rainfall records are established at a given weather observing station, regardless of their cause(s), significant amounts of precipitation are usually measured at most of the other stations in the site area. This is usually not the case for maximum 24-hour rainfall records because of the intense nature of the storm events in this coastal area. However, t~~ There does not appear to be any clear relationship between the rainfall recorded during extreme events, whether on a 24-hour or monthly basis, and distance inland within the area considered around the STP site (see Figure 2.3S-1). Therefore, based on the range of the maximum recorded 24-hour and monthly rainfall totals among these stations, the areal distribution of these climatological observing stations around the site, and their proximity to the site, the data suggests that rainfall extremes close to the upper limits of the respective maxima might reasonably be expected to occur at the STP site.

Section 2.3S.6 will be updated to include two new references to the NCDC SDM and SDD report and a reference to the NOAA Daily Weather Map project as shown below:

2.3S-XXl National Climatic Data Center, Climate Data Online, Surface Data, Monthly, NCDC, NOAA, Available at http://cdo.ncdc.noaa.gov/cgi-bin/cdo/cdostnsearch.pl, accessed November 20, 2008.

2.3S-XXm National Climatic Data Center, Climate Data Online, Surface Data, Daily – US, Data Access, NCDC, NOAA, http://cdo.ncdc.noaa.gov/CDO/cdo, accessed November 24, 2008.

2.3S-XXn NOAA Central Library U.S. Daily Weather Maps Project NCDC, NOAA, http://www.hpc.ncep.noaa.gov/dwm/dwm.shtml, accessed December 9, 2008.

RAI 02.03.01-19:

QUESTION:

Confirm some of the data statistics presented in FSAR Table 2.3S-3 and revise as necessary. FSAR Table 2.3S-3 presents climatological extremes at selected National Weather Service and cooperative observing stations in the STP site area. The staff reviewed the maximum 24-hour and maximum monthly snowfall statistics provided in FSAR Table 2.3S-3 against the NCDC's Climate Data Online (CDO) Surface Data, Daily (SDD) and found the following discrepancies:

(a) For the Danevang 1W maximum 24-hour snowfall, FSAR Table 2.3S-3 reports a value of 10.5 inches for 12/23/2004 whereas the NCDC SDD reports a value of 10.5 inches for 12/25/2004.

(b) For the Victoria Regional Airport maximum 24-hour snowfall, FSAR Table 2.3S-3 reports a value of 2.1 inches for 01/12/1985 whereas the NCDC SDD reports a value of 3.3 inches for 02/12/1958.

(c) For the Victoria Regional Airport maximum monthly snowfall, FSAR Table 2.3S-3 reports a value of 2.1 inches for 01/1985 whereas the NDCD SSD reports a value of 3.3 inches for 02/1985.

RESPONSE:

The climatological extremes related to the Danevang 1W maximum 24-hour snowfall, Victoria Regional Airport maximum 24-hour snowfall, and Victoria Regional Airport maximum monthly snowfall in Table 2.3S-3 will be updated to reflect values from the NCDC SDD and CDO SDM database. The monthly maximum snowfall for Victoria Regional Airport will be updated to reflect the maximum value found in the NCDC Climate Data Online, Surface Data Monthly database of 3.4 inches maximum monthly snowfall for 02/1958 which is different from the 3.3 inches on 02/1985 suggested in part c) of RAI 02.03.01-19.

The 4th station row, 5th data column of Table 2.3S-3 will be revised as part of the response to RAI 02.03.01-18; the date will be changed to 12/25/2004 rather than the original date of 12/23/2004.

The 13th station row, 5th data column of Table 2.3S-3 will be revised as part of the response to RAI 02.03.01-18 to 3.3 rather than the original value of 2.1.

The 13th station row, 6th data column of Table 2.3S-3 will be revised as part of the response to RAI 02.03.01-18 to 3.4 (this is higher than the value of 3.3 inches indicated in the RAI question) rather then the original value of 2.1.

RAI 02.03.01-20:

QUESTION:

Confirm some of the data statistics presented in FSAR Table 2.3S-5 and revise as necessary. FSAR Table 2.3S-5 presents climatological normals at selected National Weather Service and cooperative observing stations in the STP site area. The staff reviewed the climatological normals provided in FSAR Table 2.3S-5 and found the following discrepancies:

(a) For Victoria Regional Airport normal annual snowfall, FSAR Table 2.3S-5 reports a value of 0.1 inches whereas the Climatography of the United States, No. 20 reports a value of 0.3 inches.

(b) For Palacios Muni Airport, daily maximum and daily minimum temperatures of 77.2 °F and 61.1 °F imply a daily range of 16.1 °F whereas FSAR Table 2.3S-5 reports a daily range value of 19.4 °F.

(c) For Bay City Waterworks, daily maximum and daily minimum temperatures of 80.6 °F and 61.2 °F imply a daily range of 19.4 °F whereas FSAR Table 2.3S-5 reports a daily range value of 16.1 °F.

RESPONSE:

(a) Victoria Regional Airport normal annual snowfall provided in Table 2.3S-5 will be updated to 0.3 inches instead of 0.1 inches as shown below.

(b & c) The climatological normals in Table 2.3S-5 will be revised to reflect the conditions for the Bay City Waterworks daily temperature range (3rd station row, 3rd data column) and Palacios Muni Airport daily temperature range (2nd station row, 3rd data column) due to a typographical error.

The second paragraph in Section 2.3S.2.2.6 will be revised to reflect the changes made in Table 2.3S-5:

> Measurable snowfall occurs only rarely in the STP 3 & 4 site area, as discussed in Subsection 2.3S.1.3.4, with normal annual totals at all observing stations averaging less than ~~0.2~~ 0.3 inches (Reference 2.3S-2).

Table 2.3S-5 Climatological Normals at Selected NWS and Cooperative Observing Stations in the STP 3 & 4 Site Area

	Normal Annual Temperatures (°F) [1]				Normal Annual Precipitation	
Station	**Daily Maximum**	**Daily Minimum**	**Daily Range**	**Daily Mean**	**Rainfall [1] (inches)**	**Snowfall [2] (inches)**
Matagorda 2	77.5	61.8	15.7	69.7	43.75	0.1
Palacios Muni Airport	77.2	61.1	~~19.4~~ 16.1	69.2	45.40	0.1
Bay City Waterworks	80.6	61.2	~~16.1~~ 19.4	70.9	48.03	0.0
Danevang 1W	79.0	58.5	20.5	68.8	45.37	0.2
Maurbro [3]	–	–	–	–	–	–
Pierce 1E	79.7	58.0	21.7	68.9	45.92	Trace
Point Comfort	79.7	62.4	17.3	71.1	43.87	Trace
Port O'Connor	76.4	65.0	11.4	70.7	34.78	0.1
Wharton	–	–	–	–	45.62	–
Edna Hwy 59 Bridge	–	–	–	–	42.17	–
Freeport 2NW	77.6	62.1	15.5	69.8	50.66	Trace
Angleton 2W	78.5	59.9	18.6	69.2	57.24	0.1
Victoria Regional Airport	79.6	60.4	19.2	70.0	40.10	~~0.1~~ 0.3
Thompsons 3WSW	79.6	59.3	20.3	69.5	45.81	0.1
Aransas Wildlife Refuge	77.5	62.9	14.6	70.2	40.83	Trace

[1] Reference 2.3S-3
[2] Reference 2.3S-2
[3] Station decommissioned in 1966

RAI 02.03.02-5:

QUESTION:

Confirm the length of the longest wind direction period for the 60-meter level and revise FSAR Section 2.3S.2.2.2 as necessary.

FSAR Section 2.3S.2.2.2 provides information regarding wind direction persistence. This section states the longest wind direction persistence period at the 60-m level is 30 hours. However, the staff found two longer persistence periods: a 33-hour period ending at hour 16 on day 55 of 1997 and a 32-hour period ending at hour 0 on day 338 of 2000.

RESPONSE:

The "hour" listed in wind direction persistence tables (FSAR Tables 2.3S-7 and 2.3S-8) is the lower limit within a period. For example, in the persistence tables, between Hour 30 and 36 there is no intermediate period (i.e., 32 or 33). Since 32 and 33 hours are greater than 30, but less than 36, the 32 and 33 hours of occurrences are classified within the 30 - 36 hour period. In the persistence tables, the lower limit (i.e., 30) is used as the heading for the period that covers 30 to 36 hours). Therefore, the frequency counts identified in the persistence tables in the 30-hour period actually represent the frequency counts that occur between 30 and 36 hours, or stated another way the frequency count for winds of at least 30-hour persistence.

To provide clarification, the third and fourth paragraphs of FSAR Section 2.3S.2.2.2 will be revised as follows:

> Wind direction persistence hours as listed in Table 2.3S-7 are the lower limits within the ranges. At the 10-m level, the longest persistence period is 30 to 36 hours for winds from the southeast sector. This duration appears only in the lowest two wind speed groups (i.e., for wind speeds greater than or equal to 5 mph and 10 mph). Persistence periods of 24 to 30 hours for winds ~~less~~ greater than or equal to 5 mph are indicated for several direction sectors, including winds from the east, south-southeast, southeast, south, west-southwest, and north-northwest. For wind speeds greater than or equal to 20 mph, maximum persistence periods are limited to 8 to 12 hours.
>
> Wind direction persistence hours as listed in Table 2.3S-8 are the lower limits within the ranges. At the 60-meter level, the longest persistence period is ~~also~~ 30 to 36 hours, and ~~but~~ occurred for two different sectors (i.e., winds from the north and east-northeast). This duration appears only in the lowest two wind speed groups for the north and east-northeast sectors, and for the lowest three wind speed groups for the east-northeast sector (i.e., for wind speeds greater than or equal to 5, 10, and 15 mph). Persistence periods of 24 to 30 hours are indicated for multiple direction sectors for the lowest three wind speed groups. For wind speeds greater than or equal to 25 mph, maximum persistence periods are limited to 8 to 12 hours with the exception of one 12- to 18-hour duration from the south sector.

RAI 02.03.02-6:

QUESTION:

Confirm the STP site's air quality attainment status designations and revise FSAR Section 2.3S.2.5.1 as necessary. FSAR Section 2.3S.2.5.1 provides information regarding STP site's air quality attainment status designations.

(a) FSAR Section 2.3S.2.5.1 states that the Metropolitan Houston-Galveston Intrastate Air Quality Control Region (AQCR 216) is in attainment for all criteria pollutions (except for the 8-hour ozone standard in certain counties) where attainment areas are areas where the ambient levels of criteria air pollutants are designated as being "better than," "unclassifiable/attainment," or "cannot be classified or better than," EPA-promulgated National Ambient Air Quality Standards. Note that AQCR 216 attainment status has not been designated for lead (40CFR81.38).

(b) FSAR Section 2.3S.2.5.1 states that certain counties within AQCR 216 (exclusive of Matagorda County) have been classified as moderate nonattainment for the 8-hour ozone standard. Note that the EPA has proposed to grant a request by the Governor of the State of Texas to voluntarily reclassify the AQCR 216 ozone nonattainment area from a moderate 8-hour ozone nonattainment area to a severe 8-hour ozone nonattainment area (72FR74252, December 31, 2007).

RESPONSE:

As stated in the Federal Register in Volume 73, No. 191, pages 56983-56995, the Environmental Protection Agency (EPA) has granted a request from the Governor of the State of Texas to reclassify the Metropolitan Houston-Galveston Intrastate Air Quality Control Region (AQCR 216) status as severe ozone nonattainment area as stated on October 1, 2008, to be effective October 31, 2008. The status for lead has not been designated for most of the State of Texas, including the counties listed in AQCR 216. The second paragraph of FSAR Section 2.3S.2.5.1 will be revised as follows:

> The Metropolitan Houston-Galveston Intrastate Air Quality Control Region (AQCR 216) is in attainment for all criteria pollutants with the exception of the 8-hour ozone standard in Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties and for lead. ~~All of these counties were classified as "moderate" non-attainment (Reference 2.3S-32).~~ The EPA has granted a request from the Governor of the State of Texas to reclassify the ozone nonattainment status in Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties as severe (73 CR 56983, October 1, 2008, Reference 2.3S-XX). The attainment status for lead has not been designated for any county in AQCR 216 (Reference 2.3S-YY). All of these counties are located either northeast or north-northeast of Matagorda County, with the closest being Brazoria County directly northeast.

Section 2.3S.6 will be updated to include two new references as shown below:

2.3S-XX "TX068.46 Clean Air Act Reclassification of the Houston/Galveston/Brazoria Ozone Nonattainment Area; Texas; Final Rule" *Code of Federal Regulations* Title 40, Pt. 81, (1 October 2008) p. 56983-56995. [Available at http://www.regulations.gov].

2.3S-YY "Designation of Areas for Air Quality Planning Purposes". *Code of Federal Regulations*, Title 40, Pt. 81, Subpart C, Section 107. Accessed on December 9, 2008. [Available at http://ecfr.gpoaccess.gov].

RAI 02.03.03-6:

QUESTION:

FSAR Sections 2.3S3.2 and 2.3S3.3 describe the preoperational and operational onsite meteorological monitoring programs, respectively. RG 1.206 Section C.I.2.3.3 states the applicant should describe both the preoperational and operational monitoring programs, including calibration and maintenance procedures, data output and recording systems, and data processing, archiving, and analysis procedures.

Either revise FSAR Section 2.3S3.3 to clarify whether the calibration and maintenance procedures described in FSAR Section 2.3S.3.2.3 and the data display, processing, archiving, and analysis described in FSAR Section 2.3S.3.2.5 for the preoperational meteorological monitoring program will continue for the operational meteorological monitoring program, or justify an alternative response.

RESPONSE:

FSAR Section 2.3S.3.3 will be revised to clarify information related to the calibration and maintenance procedures; and the data display, processing, archiving and analysis procedures for the onsite meteorological monitoring system as follows:

2.3S.3.3 Operational Program

The STP 1 & 2 onsite meteorological monitoring program is conducted in accordance with the guidance and system accuracy specified in RG 1.23 (Reference 2.3S-28). This ~~system~~ program, including the calibration and maintenance procedures described in Subsection 2.3S.3.2.3, and the data display, processing, archiving, and analysis procedures described in Subsection 2.3S.3.2.5 will continue to be used as the operational onsite meteorological monitoring ~~system~~ program for STP 1, 2, 3 & 4.

RAI 02.03.05-8:

QUESTION:

Review an apparent discrepancy between the receptor distances listed in FSAR Table 2.3S-26 and the Land Use Census reported in the STP 2006 Annual Environmental Operating Report and revise the FSAR as necessary.

FSAR Section 22.3S.5 describes the long-term atmospheric dispersion analyses for routine releases and FSAR Table 2.3S-26 lists the distances from the release point to sensitive receptors of interest (e.g., vegetable garden, meat animal, resident). In comparing the assumed distances from the STP 1 & 2 reactors to the receptors of interest presented in FSAR Table 2.3S-26 with the Land Use Census results presented in the STP 1 & 2 2006 Radiological Environmental Operating Report, the staff notes the following discrepancies:

(a) FSAR Table 2.3S-26 states that the distance to the receptors of interest in the ENE sector is 8000 meters whereas the 2006 Land Use Census states that the distance to this receptor is approximately 4.5 miles (7242 meters).

(b) FSAR Table 2.3S-26 states that the distance to the receptors of interest in the WNW sector is 6400 meters whereas the 2006 Land Use Census states that the distance to this receptor is approximately 4.5 miles (7242 meters).

RESPONSE:

The receptor distances listed in FSAR Table 2.3S-26 were derived from information included in Revision 13 of the STP Offsite Dose Calculation Manual, dated January 1, 2006. Subsequently, the receptor distances were updated in the 2006 Land Use Census as reported in the STP 1 & 2 2006 Radiological Environmental Operating Report.

In response to RAI 02.03.04-5, the long-term atmospheric dispersion estimates for routine releases are being recalculated and the receptor distances listed in Table 2.3S-26 will be revised to be consistent with information from Revision 15 of the STP Offsite Dose Calculation Manual, dated October 1, 2007. The information in Revision 15 of the STP Offsite Dose Calculation Manual reflects the distances to the receptors of interest reported in the Land Use Census results as presented in the STP 1 & 2 2006 Radiological Environmental Operating Report.

FSAR Table 2.3S-26 will be revised as part of the response to RAI question 02.03.04-5, which will be submitted by January 30, 2009 per STPNOC Letter U7-C-STP-NRC-080069, dated December 11, 2008.

RAI 02.03.05-9:

QUESTION:

Clarify some of the maximum annual average atmospheric dispersion factors (x/Q values) presented in FSAR Section 2.3S.5.2 for several sensitive receptor types and revise the FSAR as necessary.

FSAR Section 2.3S.5.2 summarizes the maximum x/Q values predicted for sensitive receptors of interest in the STP site area due to routine releases of gaseous effluents. The numbers at the beginning of the three bullets in this section need to be clarified:

(a) Should "6.2 10^{-7}" read "6.2E-07"?

(b) Should "1.3 10^{-5}" read "1.3E-05"?

RESPONSE:

The maximum annual average atmospheric dispersion factors (χ/Q values) will be updated with the following corrections to the scientific notation in the second paragraph of FSAR Section 2.3S.5.2 as shown below:

> The overall maximum annual average χ/Q value with no decay is 8.3E-05 sec/m^3 and occurs at the Unit 4 Reactor Building due to the releases from the Unit 3 Reactor Building. The maximum annual average χ/Q values (along with direction and distance of the receptor locations relative to the STP site) for the other sensitive receptor types are:
>
> - ~~6.2 10^{-7}~~ 6.2E-07 sec/m^3 for the nearest resident occurring in the WSW sector at a distance of 2.19 miles.
> - ~~6.2 10^{-7}~~ 6.2E-07 sec/m^3 for the nearest vegetable garden and meat animal. (Note the same shortest distance [2.19 miles] was used to estimate the χ/Q values for the nearest vegetable garden and meat animal.)
> - ~~1.3 10^{-5}~~ 1.3E-05 sec/m^3 for the nearest EAB occurring in the NW sector at a distance of 0.58 mi.

RAI 02.03.05-10:

QUESTION:

Clarify some of the entries in FSAR Table 2.3S-29 and revise the FSAR as necessary.

FSAR Table 2.3S-29 presents predicted annual average deposition factors (D/Q values) at standard radial distances and distance-segment boundaries for the STP site. The first row in each of the three pages of FSAR Table 2.3S-29 reads either "deltaQ at Various Distances" or "deltaQ at Various Segments." Should these read "D/Q at Various Distances" and "D/Q at Various Segments"?

RESPONSE:

The header rows of Table 2.3S-29 (which is continued on two additional pages) will be revised as follows:

Table 2.3S-29 XOQDOQ-Predicted Annual Average D/Q Values at the Standard Radial Distances and Distance-Segment Boundaries

Δ D/Qs at Various Distances
RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES CORRECTED USING STANDARD OPEN TERRAIN FACTORS

Table 2.3S-29 XOQDOQ-Predicted Annual Average D/Q Values at the Standard Radial Distances and Distance-Segment Boundaries (Continued)

Δ D/Qs at Various Distances

Table 2.3S-29 XOQDOQ-Predicted Annual Average D/Q Values at the Standard Radial Distances and Distance-Segment Boundaries

Δ D/Qs at Various Segments
RELEASE POINT - GROUND LEVEL - NO INTERMITTENT RELEASES

RAI 12.02-1:

QUESTION:

Clarify a reference to a FSAR Table 2.3S.5-2 and revise the FSAR as necessary.

FSAR Section 12.2.2 presents parameters required to evaluate airborne concentrations and doses due to routine radiological releases during normal plant operation. FSAR Section 12.2.2.1 states site specific χ/Q values from FSAR Table 2.3S.5-2 were used to re-perform the gaseous release dose analysis. There is no FSAR Table 2.3S.5-2. Should FSAR Table 2.3S-27 be referenced instead?

RESPONSE:

The correct reference for site specific χ/Q values in FSAR Subsection 12.2.2.1 is Table 2.3S-27.

This reference in FSAR Subsection 12.2.2.1 will be revised as shown below:

Table ~~2.3S.5-2~~ 2.3S-27.